Plant Waste Disposal

the OIL AND GAS JOURNAL

TIMKEN
Roller Bearing Axle Company.

Main Office: 3100 to 3110 North Second St.

ST. LOUIS, MO.

BRANCHES.

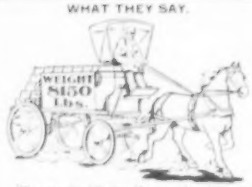
NEW YORK—No. 1709 Broadway (N. W. Cor. 57th St.)

BOSTON—No. 29 Beverly Street.

BROOKLYN—No. 40 Boerum Place.

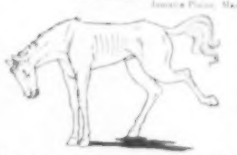
PHILADELPHIA—Fulton & Walker Co., 20th and Filbert Sts.

WHAT THEY SAY.



"We are hauling 100 cases of beer, weighing 60 lbs. each, 6000 lbs., and with the weight of the wagon, 9000 lbs., a total of 15000 lbs., with one (1) horse with ease, since we had our wagon equipped with Timken Roller Bearing Axles."

WALDBERG BREWING CO.,
Jamaica Plain, Mass.



I ask because the wagon I pull is not equipped with TIMKEN ROLLER BEARING AXLES.

IT MAKES A HORSE LAUGH

To Equip His Vehicle with
TIMKEN ROLLER BEARING AXLES
BECAUSE
His work is made easy.
He can do double the work he could formerly.
His life-time is doubled.

HIS OWNER LAUGHS EVEN MORE

BECAUSE
The draft on his vehicle is reduced over 50 per cent.
The earning capacity of his vehicle is doubled.
He has the fastest vehicle if not the fastest horse.
He has to oil his axles only twice a year.

TIMKEN
Roller Bearing
AXLES

Reduce draft over 50 per cent.

Require oiling only twice a year.

Can be substituted for ordinary axles on old vehicles.

Can be used with any standard wheel, old as well as new.

Are mechanically perfect. No breakages. Practically no wear.

Are easily adjusted. No play. No rattling. No lost motion.

Are adapted to all vehicles from the lightest speeding wagon to the heaviest truck and railroad car. Best on earth for automobiles.

Do your horses play out?
Do you want to double their serviceable life?
Do you want to double the earning capacity of your vehicles?
Do you want to decrease the number of horses required to do your work?
Do you want to reduce stable expenses?
Do you want to pass other drivers?
Are you tired of oiling your axles every day or two?

IF SO, EQUIP ALL YOUR VEHICLES WITH

TIMKEN
ROLLER BEARING AXLES.

FOR SALE BY
All First Class Carriage and Wagon Manufacturers and Dealers.

Write us for booklet "Saving the Horse"

Address all communications to
TIMKEN ROLLER BEARING AXLE CO.
Department F, St. Louis, Mo.

In terms of performance—

TIMKEN® bearings still give you more for your money than any other bearings you can buy

IN 1901, Timken® tapered roller bearings were used mainly in wagon wheels. They saved "horsepower" manpower, materials and equipment. They were the best bearings you could buy.

Today, 53 years later, Timken tapered roller bearings are used in thousands of applications. They *still* save horsepower, manpower, materials and equipment. And they're *still* the best bearings you can buy.

Why? Because we've never stopped improving Timken bearings. One example: we're the only U. S. bearing manufacturer that makes our own steel to control bearing quality every step of the way.

In terms of performance, Timken bearings *still* give you more for your money than any other make. The Timken Roller Bearing Company, Canton 6, Ohio. Canadian plant: St. Thomas, Ontario. Cable address: "TIMROSCO".

TIMKEN
TRADE-MARK REG. U. S. PAT. OFF.
TAPERED ROLLER BEARINGS

NOT JUST A BALL ◯ NOT JUST A ROLLER ▭ THE TIMKEN TAPERED ROLLER ▭

BEARING TAKES RADIAL ⇩ AND THRUST →▯← LOADS OR ANY COMBINATION ⇩→

Samson

OF THE BIG FRAC

Giants roam the earth these days . . . Samsons of horsepower whose great strength is harnessed to a new production improvement technique. This process is called the "big frac", field-name for high volume formation fracturing. Halliburton pioneered this important service. For over five years Halliburton's huge red and silver fracturing equipment has been a familiar sight in the oil fields. It set a remarkable record – 3 out of 4 wells fractured have increased initial production, obtained a more favorable PI, and improved sustained production. This success has come not only from proper equipment but from wide experience as well – priceless experience on more than 35,000 fracturing jobs that is Halliburton's alone. Knowing when, where, and how to use the Samson of the big frac make Halliburton first choice for this important production improvement technique.

HALLIBURTON OIL WELL CEMENTING COMPANY
DUNCAN, OKLAHOMA

PERPETUAL PROGRESS IN PRODUCTION IMPROVEMENT TECHNIQUES

the OIL AND GAS JOURNAL AUGUST 16, 1954 VOL. 53 NO. 15

OIL IN THE NEWS . . .

Iranian Oil Will Have Little Effect on This Country 84
Reconditioning of Stanolind's Synthesis Plant Under Way 87
Competition Among Factors Providing Fuel for Today's Octane Race 88
Socony-Vacuum Plans Nine More Cat Reformers, Upping Total to 13 91
Independents Balk, But O.W.I.U.-Chemical Workers Merger Progresses 92
Rocky Mountain Refiners Have Pricing Problem, But Break on Octane 93
NLRB Sets Precedent in Ordering Lion Oil to Reimburse Strikers 96
I.P.A.A. Attorney Says FPC Overstepping Newly Won Authority 96
Eisenhower Signs Bills for Tanker Construction, Trade-In Deals 100
Richfield Revives Wells Abandoned 28 Years 102
West Coast Production Running Below That of 1953 103
New Brief Filed in Suit Attacking Spending of Oil Funds 103
Union Completes First Phase of $43,000,000 Refinery Program 104
Texas Commission Wants to Know Buying Habits in Other States 104
Shell Trades Boats for Trucks as Louisiana Swamp Dries Up 105
Pure Prepares to Spud Well in Outer Continental Shelf off Texas 105
Louisiana Will Try to Collect Tax on Newly Claimed Tidelands 105
Latin American Refining Capacity to Show 10 Per Cent Rise This Year 107
First Units of 120,000-Bbl. Aden Refinery Go On Stream 109

TECHNOLOGY AND OPERATION . . .

[1]POLLUTION CONTROL . . . A SYMPOSIUM 110-121
1. Conducting a Refinery Waste-Stream Survey 110
2. Oil and Sludge Removal at Skelly's El Dorado Plant 114
3. Chemical Flocculation of Refinery Waste 118
[2]Where's That Pipeline Pig? 122
By W. H. Stewart
[3]Ethylene is Big Business With Gulf 125
By P. W. Cornell, W. H. Litchfield, and H. M. Vaughan
Slim Holes Drilled With Air 129
Fitting Sulfur Recovery Into Gasoline Plants 130
Light Crude Oil Successfully Fractures Massive Limestone 132
Fracturing Rejuvenates a Veteran Field 136
[4]"Soap" Washes Oil Out of Sand 139
By H. M. Dunning, Lun Hsiao, and R. T. Johansen
Engineering Reference Section 150-158
[5]Pipeline Patrol: Oil-Well Packer Solves Gas Pipeline Problems 159

EXPLORATION . . .

Simpson Group Jumps Into Oklahoma News 187
Order is Emerging Out of Nomenclature Chaos 188

NEWS FEATURES . . .

They Say 67
Calendar of Events 70
Journally Speaking 79
Editorial 81
This Week 83
Watching Washington 98
International News 107
Refining News 163
Personals 209
Deaths in the Industry 211
Statistical Summary 212
Drilling Statistics 213
Supply Statistics 214
Refining Statistics 215
Demand Statistics 216

DEPARTMENTS . . .

Technical Questions 150
Refiners' Notebook 151
Instruments 155
Field Processing 157
Pipeline Patrol 159
Equipment Digest 171
Trade Literature 176
Equipment Men in News 182
Classified Advertising 217
Advertisers' Index 221

FIELDS . . .

Drilling Contractors 127
Area Field Report 161

In Brief . . .

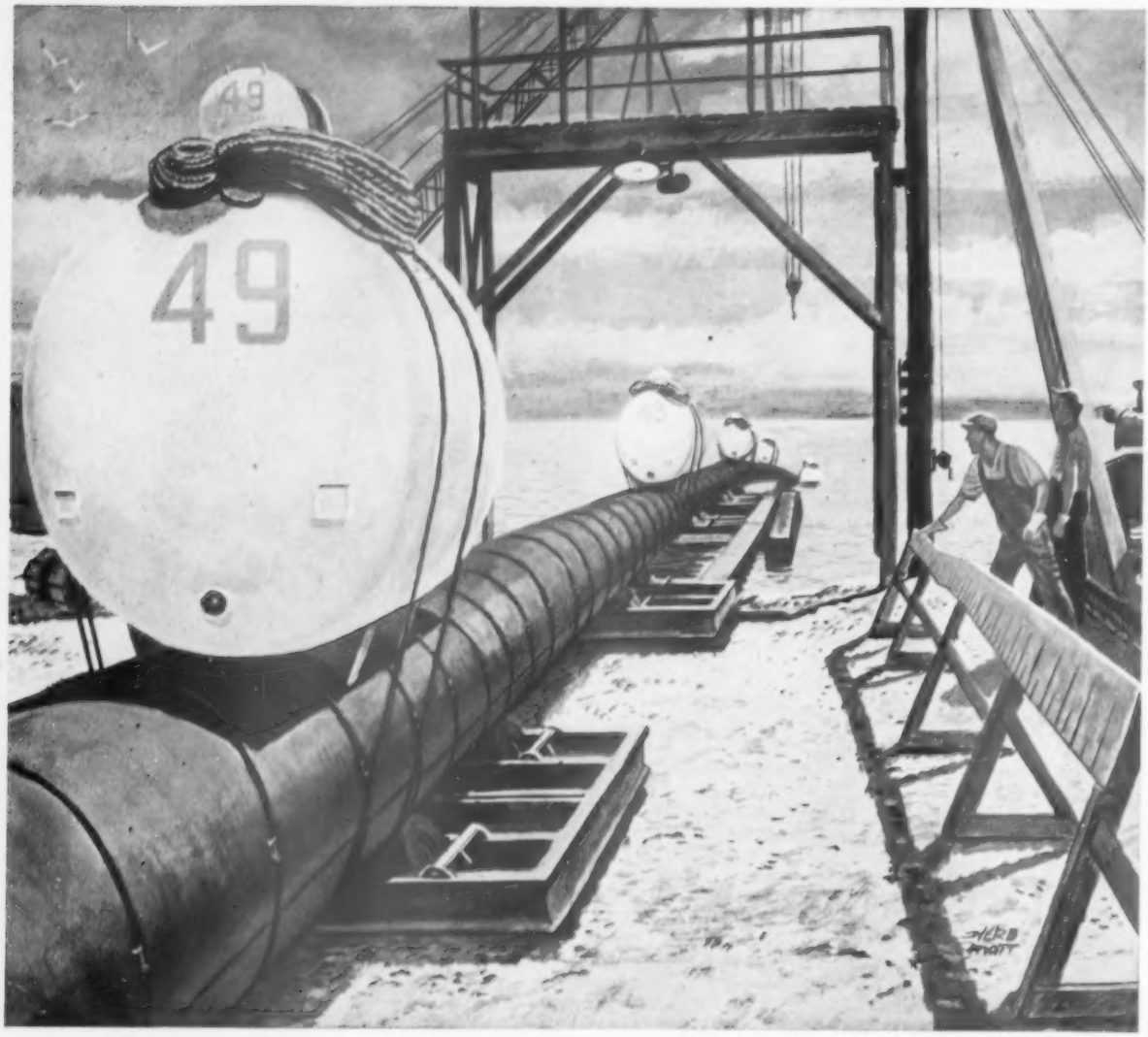
1. POLLUTION CONTROL . . . This three-paper symposium covers three problems encountered by refiners who are beginning to do something about pollution control: (1) organization of an over-all waste-stream survey; (2) removal of oil and sludge from waste water, and (3) reduction of biological oxygen demand and control of effluent pH.

2. PIG LOCATER . . . A magnetic scraper locater is used by Sun Pipe Line Co. to quickly and accurately locate a stuck scraper. The portable instrument consists of detector probe, electronic amplifying circuit, indicating meter, a pair of earphones, and battery power supply.

3. BIG ETHYLENE PLANT . . . Gulf Oil Corp. is producing large quantities of ethylene at its Port Arthur, Tex., refinery and distributing it to many Gulf Coast customers through more than 130 miles of pipeline. This paper covers a number of critical operating problems encountered in ethylene production.

4. MORE OIL WITH SOAP . . . The Bureau of Mines has tested the effectiveness of a large number of water-flooding activities. Water-soluble detergents have shown the most consistent effectiveness in increasing petroleum recoveries. These substances generally are capable of causing considerable reductions in interfacial tensions.

5. PIPELINE USES PACKER . . . An oil-well packer has been adapted to gas-pipeline use by Texas Illinois Natural Gas Pipeline Co. This packer permits the removal and replacement of inadvertently installed and unsuitable alloy pipe without interfering with normal gas transmission.



"Long haul" at Mackinac

Down she goes to the bottom of the famous Straits of Mackinac for the deepest underwater crossing ever made by a pipeline.

It was a tough job requiring the best in men and the best in materials. It is significant that Barrett Protective Coatings were specified from start to finish.

When you specify Barrett, you get not only the best in protective coatings, but the expert assistance of the Barrett Technical Service Group. Right at the planning stage, they'll help you select the coating that provides top protection at minimum cost. These coatings will prolong the life of steel pipelines indefinitely, while increasing the cost by only the smallest fraction.

In the field, Barrett Service Representatives are available for "on the job" assistance in the proper methods of handling and applying coating material.

We welcome the opportunity to place the Barrett Technical Service Group at *your* service. For detailed information—phone, write, wire Barrett.

Approved Barrett Applicators are available for field or special work throughout the country. BARRETT DIVISION, Allied Chemical & Dye Corporation, 40 Rector Street, New York 6, N. Y. In Canada: The Barrett Company, Ltd., 5551 St. Hubert St., Montreal, Que.

Allied Chemical

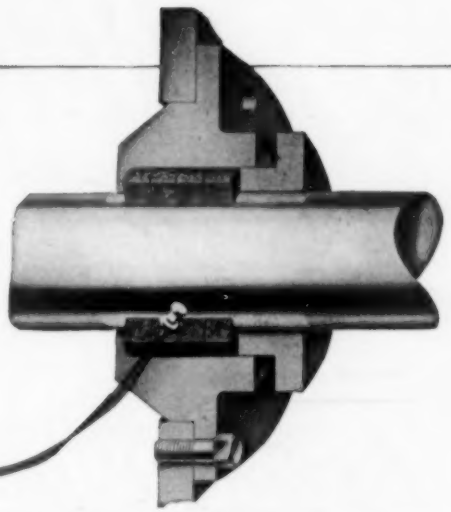
1854 1954 CENTENNIAL Barrett 100 YEARS OF EXPERIENCE

BARRETT PROTECTIVE COATINGS

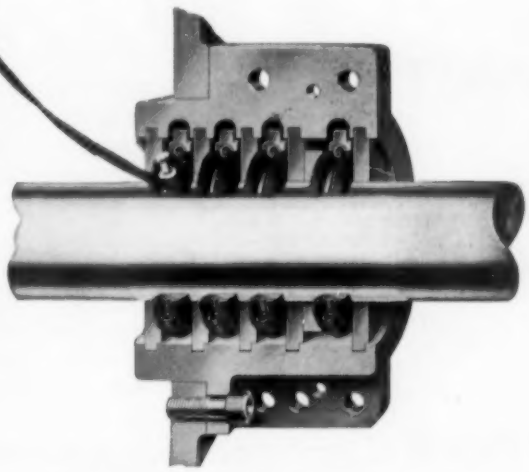
100 YEARS OF EXPERIENCE

COPPUS TURBINES

offer you a choice of packing rings



STANDARD METALLIC RING PACKING — Made of high grade asbestos cores encased in specially treated lubricated aluminum foil. Recommended as a low-friction, long-service packing for steam temperatures up to 850 F and back pressures up to 50 lb. Adjustable packing glands keep leakage at minimum. Easy access to packing rings.



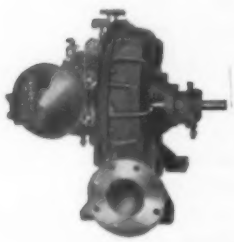
OPTIONAL CARBON RING PACKING — Consists of three carbon packing rings on the pressure side and one beyond the leak-off section. Each ring has three segments held together by a stainless steel garter spring. For back pressures up to 75 lb. Standard for vacuum or gas operation, or when leak-off is desired.

Heavy chrome plating on shaft at stuffing box is common to both types of Coppus packing.

Coppus Turbines ranging from 150 hp down to fractional in 6 frame sizes

FIT TURBINE COSTS TO HORSEPOWER NEEDS

When you buy turbines rated close to your exact horsepower needs, you save plenty of money. That's because turbines are generally priced in proportion to their size. The wide range of sizes of Coppus Turbines promises purchasing economy for you from the 150 hp size down to the smallest. As for operating and maintenance economies, you get them, too, from such other features as: greater number of manually operated valves for individual control of steam nozzles; replaceable cartridge-type bearing housings and others. For complete details . . .



WRITE FOR BULLETIN 135
COPPUS ENGINEERING CORPORATION
269 Park Avenue
Worcester 2, Mass.
Sales offices in THOMAS' REGISTER

COPPUS "BLUE RIBBON" TURBINES

3 Good Ways to get TOP SERVICE from Piston Rods

in your "Oilwell" and Wilson-Snyder Slush Pumps

FIRST . . . **USE "OILWELL" HI-HARD PISTON RODS!** They are fully heat-treated and have round root type threads which resist "notched fatigue" action. Induction-hardened surfaces are ground and polished to resist wear. They are accurately machined to assure perfect alignment when made up with the crosshead extension.

SECOND . . . **USE DI-HARD LINERS!** They're your assurance that outside diameters are exactly right to center the liner in the cylinder bores of your pump . . . so that piston rods and packing-ring centers will align accurately. This prevents one-sided wear between rods and packing which often results in premature cutting or scoring of the rods as well as excessive packing wear.

THIRD . . . **SERVICE STUFFING BOX PACKING REGULARLY** . . . in accordance with the manufacturer's recommendations . . . so that friction areas between rods and packing will be properly lubricated to prevent abrasive action over that segment of the rod surfaces.

FIND OUT FOR YOURSELF** . . . how much better your "Oilwell" and Wilson-Snyder pumps perform . . . and how much you can save by using HI-HARD Piston Rods . . . . . **EXCLUSIVELY!

OIL WELL SUPPLY
DIVISION
UNITED STATES STEEL CORPORATION

Executive Offices—DALLAS, TEXAS
Export Office—
30 ROCKEFELLER PLAZA
NEW YORK 20, N. Y.

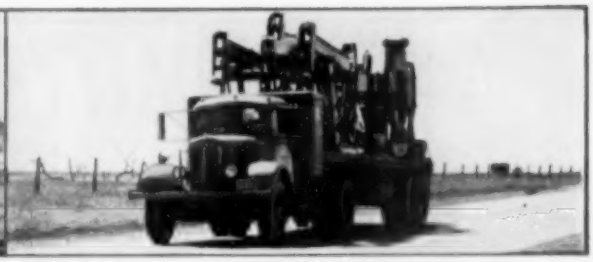
Area Offices — CALGARY, CANADA
CASPER, WYOMING . . . COLUMBUS, O.
DALLAS, TEXAS . . . HOUSTON, TEXAS
TULSA, OKLA. . . . LOS ANGELES, CALIF.

Branches Serving All Oil Fields

USS TRADE MARK

"OILWELL" TRADE MARK

UNITED STATES STEEL



From Delivery Date Through

New T12D-D80Z
Wide Frame Unit.

Years of Service

American Gives You MORE

Your American Pumping Unit is delivered right *when* you want it—right *where* you want it . . . at well site on your lease. This factory-to-lease safe delivery of your unit is standard American policy and is included in your zone price on all units ordered in truck load quantities.

AMERICAN FOLLOWS UP!

American service does not stop with delivery. American maintains a complete service record on all units. Trained field men periodically check American Pumping Units in the field—offer suggestions on maintenance—show you how to get even longer wear, more satisfactory service, and low-cost pumping from your unit. These same field men are also available to give prompt service in case of an emergency.

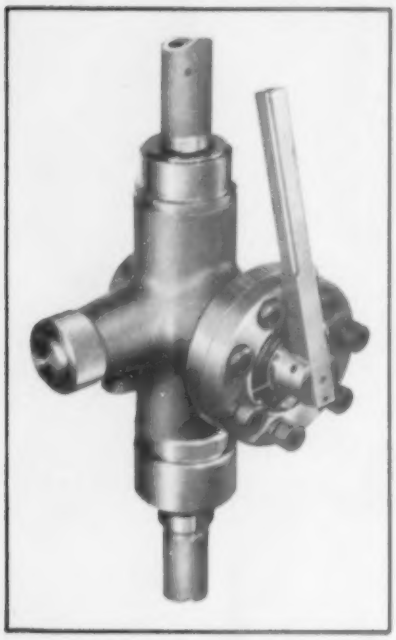
Consider this trouble-free delivery and extra years of service when you buy your next unit—you'll find it costs less to buy AMERICAN.

AMCOT **AMERICAN** MANUFACTURING COMPANY OF TEXAS

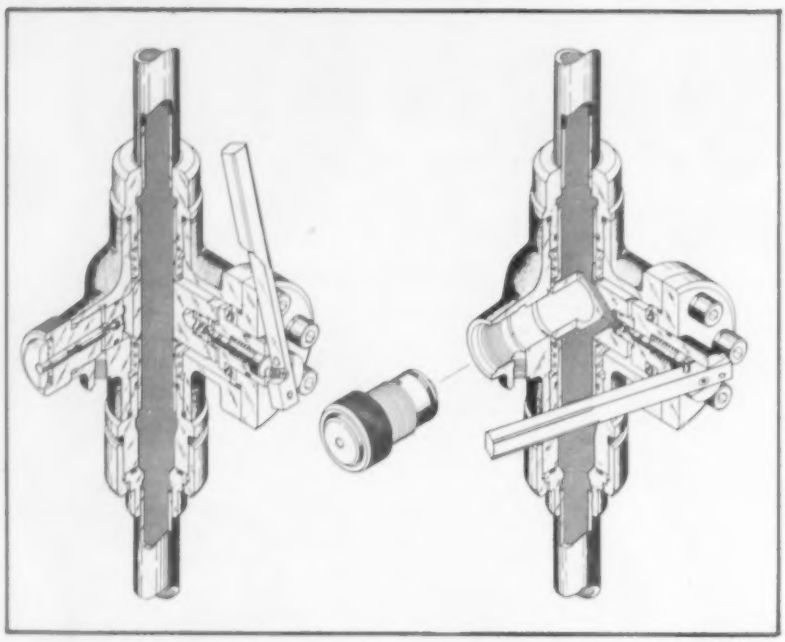
11 Anniversary

P. O. Box 7037 • FORT WORTH 11, TEXAS • Odessa • Tulsa • Kilgore • Houston • New York • Casper • Calgary, Alta.

The Oil and Gas Journal, published Mondays, copyright 1954, by The Petroleum Publishing Company. Entered as second-class matter September 1, 1910, at post office at Tulsa, Okla., under act of March 3, 1879. U. S. and foreign rates to the petroleum industry, $4 yearly.



1. Photograph of new soluble plug injector with handle in operating position.



2. Section drawing through soluble plug injector showing flow in "operate" position.

3. Flow through injector when handle is in "load" position. Loading cap removed.

Unique High Pressure Valve Permits Operator To

Inject Paraffin Control Plugs Without Flow Interruption

A new valve, which has recently been perfected, permits the insertion of soluble plugs into high pressure oil lines without interrupting flow.

Where It Is Used—The principal use of the new device, called a "soluble plug injector," will be as a part of the hydraulic system of pumping oil wells.

In that system, deposition of paraffin in surface lines and in well tubing is removed by using hydraulic power to force soluble plugs through the line to scrape paraffin loose. It is normal practice to force the paraffin either to the bottom of the well in the case of tubing deposits, or to the tank in the case of surface flow lines.

To perform the operation of injection soluble plugs it has heretofore been necessary to shut off flow and drain the line prior to inserting the plug. The new injector, however, eliminates this requirement and thereby greatly simplifies the operation.

In its present form, the new injector is applicable for injecting plugs in surface power oil lines at the central power control station. It is also used under the 4-way valve of the parallel type hydraulic Free Pump System for running soluble plugs down the production (small string) tubing.

The injector is available in 1" and 1¼" sizes and is designed for 5,000 psi working pressure.

How It Works—The assembly is of unique design. Within its cast steel body is a plug which is square-in cross section. Through this square plug is a large diameter hole which serves as the loading chamber for the soluble plug. In the operating position, the square plug is oriented so the large hole is in line with the flow going through the injector. The square plug itself is held between two spring loaded shoes which serve to direct flow through the hole.

When the square plug is turned 90° (to "Load" position) by the external operating handle, the spring loaded shoes unseat as the plug is rotated. They ride up over the corners of the plug, and slide to a new seat on a pair of opposing faces. In this position, there is a fluid channel between the two shoes through a hole drilled in the square plug so as to bypass the loading chamber.

In the load position, the chamber in the square plug is in line with a loading cap. By bumping a bleeder valve in the cap, the line pressure within the loading chamber is relieved and the cap can be removed.

At this time, the seating shoes are hydraulically held on seat and force the line fluid to flow through the bypass channel. As soon as the soluble plug is inserted in the loading chamber and the cap replaced, the operating handle is turned back to "Operate" position. This puts the soluble plug into the flow stream which forces it down the line. Flow through the injector is continuous throughout the operation—it is never interrupted.

Availability—The soluble plug injectors are available, in any quantity. Order from the manufacturer, **KOBE, INC.,** 3040 East Slauson Avenue, Huntington Park, California, or through any of the company's district offices.

ADVERTISEMENT

DON'T WILDCAT ON USED EQUIPMENT!

You can rely on a

Only from your CATERPILLAR DEALER—
a $10,000 GUARANTEE on used
Caterpillar-built oilfield equipment.
Other big values in units of any make.

BONDED BUY

YOUR Caterpillar Dealer feels that there is enough risk in drilling without taking chances on used equipment. And he's backing up his words with money.

Right now he is ready to offer you a "BONDED BUY" on used Caterpillar-built equipment, backed by a bond of $10,000 issued by The Travelers Indemnity Company. Not only are you getting reliable Caterpillar-built machines with many hours of good service left in them, but you get $10,000 worth of protection!

That's not all. Your Caterpillar Dealer is offering two other classes of used equipment—"Certified Buy" and "Buy and Try." These cover used units of *any* make.

What's your need? Drilling? Slush pits? Rig lighting and electric power? Access roads? Rig moving? Winching? It doesn't matter because your Caterpillar Dealer has used equipment for every use—*all backed in writing*. Whether you need a tractor, a motor grader or workhorse drilling engines, he has honestly-tagged equipment to meet your needs.

Save yourself time, trouble and money. See your Caterpillar Dealer, headquarters for the best buys in new and used equipment!

Caterpillar Tractor Co., Peoria, Illinois, U. S. A.

CATERPILLAR

REG. U. S. PAT. OFF.

BEST BUYS IN NEW AND USED EQUIPMENT

You KNOW what you're buying from your CATERPILLAR DEALER!

Only your Caterpillar Dealer offers you these three clear-cut classes of used construction equipment. He backs them in writing. See him for the best values on the market!

(1) "BONDED BUY." Only the best in used Caterpillar-built equipment. Each "BONDED BUY" machine is backed by a Dealer's Guarantee Bond equal to the purchase price of the machine up to a maximum of $10,000. This provides a guarantee for thirty days against unsatisfactory performance due to defective parts. If a part should prove defective within the guarantee period under the normal conditions of your job and with proper maintenance, your dealer will put your machine back into operating condition *with no charge to you for parts and labor* up to the amount of the bond. This bond is backed by The Travelers Indemnity Company. Your Caterpillar Dealer gives it to you, at no extra cost, with your purchase of a "BONDED BUY" machine. Look for the "BONDED BUY" symbol – it's your assurance of the best in used equipment.

(2) "CERTIFIED BUY." The second classification of used equipment. "Certified Buy" covers machines of any make in good condition. Your performance guarantee is in writing backed by your Caterpillar Dealer.

(3) "BUY AND TRY." Bargains in used machines of any make. Buy and try them for a period mutually agreed upon by you and your Caterpillar Dealer. Each "Buy and Try" machine carries his written "money-back" agreement.

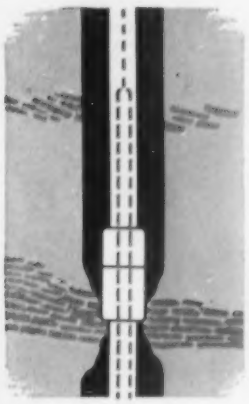
"BONDED BUY" ***assurance effective in the United States and Canada***

Copyright 1954, Caterpillar Tractor Co.

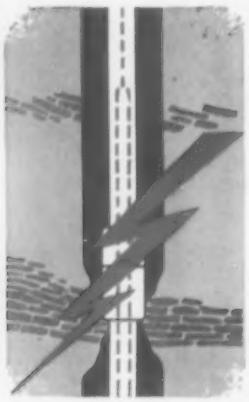
DIESEL ENGINES • TRACTORS • MOTOR GRADERS • EARTHMOVING EQUIPMENT

When you're stuck...

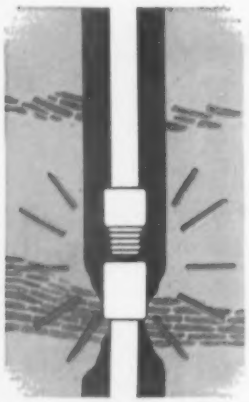
DIA-LOG's *unbeatable combination recovers drill pipe faster than any other method!*



Free Point Indicator locates lowest depth where stretch and torque can be applied on the drill string.



The "String Shot" is lowered to the same depth on the same cable and detonated to loosen tool joint.



Back off recovers stuck drill pipe, drill collars, tubing or casing to permit further fishing operations.

THE DIA-LOG FREE POINT INDICATOR

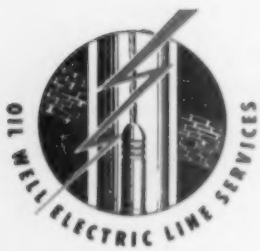
This tool accurately determines the lowest depth where *both stretch and torque* can be applied to the drill string. It locates the exact point where stuck drill pipe, drill collars, tubing or casing can be freed. Movements as small as *one-thousandth of an inch* are recorded electronically on a surface indicating panel. Since reverse torque is used to back off, pipe to be recovered must be free in torque as well as stretch. *The Dia-Log Free Point Indicator gives you this correct depth in a matter of minutes!*

THE DIA-LOG STRING SHOT BACK-OFF

On the same electric conductor cable used for the Dia-Log Free Point Indicator, a "String Shot Back-Off" is run to the desired depth. Upon detonation, the "String Shot" delivers a sharp jar sufficient to start the unscrewing of the load-free joint. In thousands of successful runs, Dia-Log has recovered *millions* of feet of stuck pipe quickly and economically by employing this infallible combination. The "String Shot" also jars loose stuck tubing packers, frozen overshots, safety joints and stuck liners.

Wherever you are stuck -- Dia-Log Service is available

Dia-Log Service is available in all domestic oil fields. Wire, write or call any Dia-Log Company or Ford Alexander Corporation office for fast, dependable recovery of drill pipe.



Gulf Coast and Mid-Continent

THE DIA-LOG COMPANY

BOX 14103 — HOUSTON, TEXAS

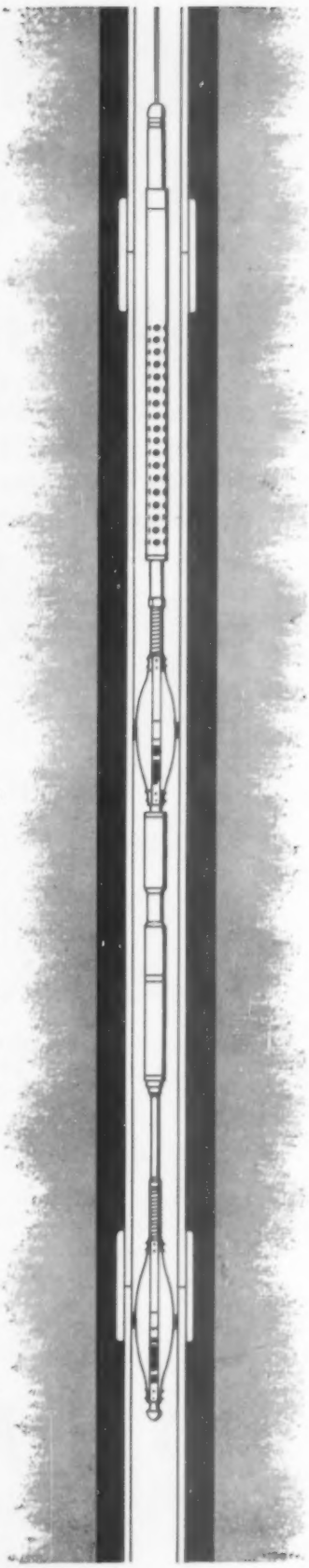
Odessa, Texas
Hobbs, New Mexico
Farmington, New Mexico
Oklahoma City, Oklahoma
Healdton, Oklahoma
Great Bend, Kansas
New Iberia, Louisiana
Houma, Louisiana
Natchez, Mississippi
El Dorado, Arkansas
Corpus Christi, Texas
Kilgore, Texas

California and Rocky Mountains

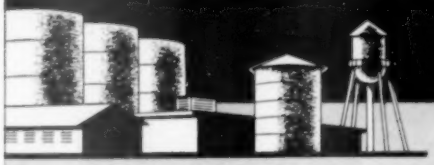
THE FORD ALEXANDER CORPORATION

BOX 800 — WHITTIER, CALIFORNIA

Ventura, California
Taft, California



fueling nozzles



No. 190 DUAL POPPETED CONTROLLABLE SPEED

No. 620 HI-PRESSURE TYPE

No. 1190 HIGH CAPACITY
AUTOMATIC SHUT-OFF NOZZLE

No. 220 GRAVITY LO-PRESSURE TYPE

OPW has designed these liquids dispensing nozzles in a wide variety of sizes to assure you of having the right nozzle for a fast, fully-controlled, dependable operation regardless of the delivery condition.

***EACH* engineered for high capacity, wide flow range with minimum turbulence; easy shut-off, with no product surge . . . *ALL*, for minimum weight, perfect balance, durability and long service life.**

OPW CORPORATION
FOR HANDLING HAZARDOUS LIQUIDS
OPW
VALVES · FITTINGS · ASSEMBLIES
CINCINNATI 25, OHIO

OPW CORPORATION

2731 Colerain Ave. • Cincinnati 25, Ohio

FREE Bulletin F-9 provides additional information about OPW's complete line of Nozzles. Write today.

Just name the valve needed--

POWELL can supply it!

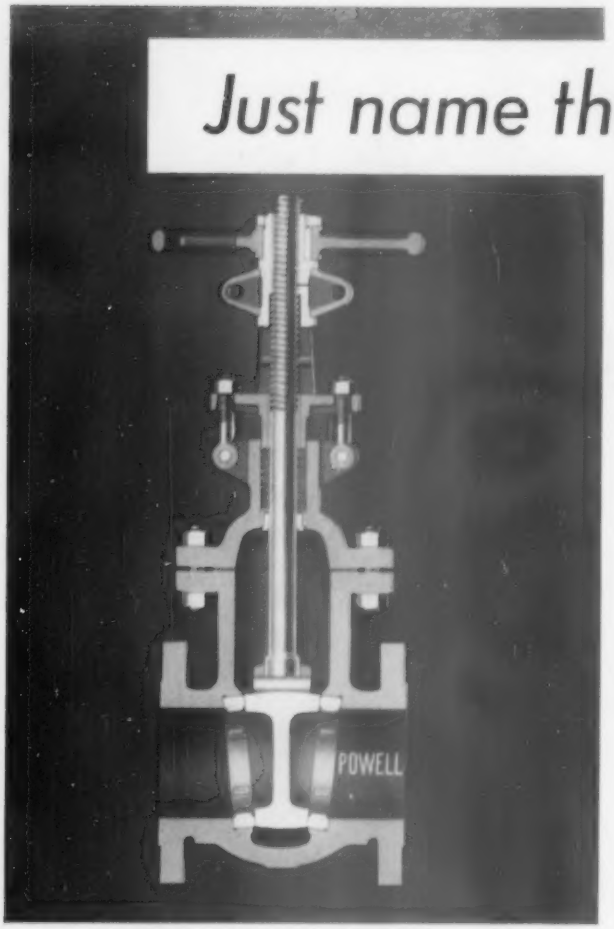


FIG. 1503 (*sectional*) —150-POUND CAST STEEL GATE VALVE. Flanged ends, bolted flanged bonnet with outside screw rising stem and yoke. Solid wedge. Available in sizes 1" to 24", inclusive.

You'll find just the valve you need in the complete line of Powell Valves. For Powell probably makes more kinds of valves—and has solved more valve problems—than any other organization in the world.

And Powell Valves have a record of dependable flow control since 1846.

Powell Valves are made ⅛" to 30" and 125 pounds to 2500 pounds W.S.P. Bronze, iron, steel and corrosion resistant alloys. Available through distributors in principal cities. On problems, write direct to The Wm. Powell Company, Cincinnati 22, Ohio.

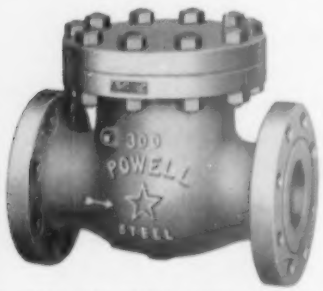


FIG. 3061—300-POUND CAST STEEL SWING CHECK VALVE. Bolted flanged cap. Heavy rugged construction. Available in sizes 1" to 12", inclusive.

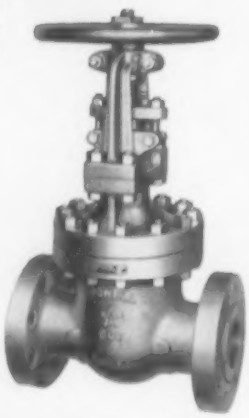


FIG. 6003—600-POUND STEEL GATE VALVE. Flanged ends, outside screw, rising stem. Available in sizes 1" to 24", inclusive.

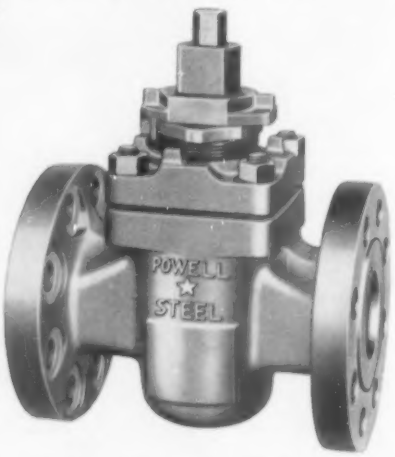


FIG. 1559—150-POUND STEEL FLANGED END LUBRICATED PLUG VALVE. (300-pound Steel, Fig. 3059.) Available with Screwed or Bolted Glands. Semi-Steel valves available for 175 and 200 pounds W.O.G. Carbon Steel valves available for 150 and 300 pounds W.P.

CONTROLS FOR THE LIFE LINES OF INDUSTRY

Powell Valves 108th year

PIPE LINE PROGRESS

Magnolia Pipe Line Company builds new 20-inch crude line with A. O. SMITH TEXAS-MADE LINE PIPE

To supply 120,000 barrels daily to its Beaumont refinery, Magnolia Pipe Line Company of Dallas is building a new 208-mile crude oil pipe line from Corsicana. The line runs directly between there and Beaumont, crossing the Trinity River ten miles south of Oakwood, and passes near the towns of Crockett, Livingston and Sour Lake.

At Corsicana, oil from East Texas, Oklahoma, West Texas and New Mexico will be pumped into the new line. Ultimately, capacity of the line can be increased to 165,000 barrels per day with new pumping equipment.

All the line pipe for this new line is from the Houston mills of A. O. Smith and Sheffield Steel . . . 20-inch welded steel pipe that's accurate as to size, roundness and end-to-end matchup. We are proud to have been able to supply Magnolia Pipe Line Company Texas-made pipe for this all Texas line.

A. O. Smith Line Pipe is available in a complete range of sizes and wall thicknesses, from 8⅝-in. to 36-in. diameters.

The A.O. Smith Casing Mill is operating at capacity to supply vitally needed casing for the Oil and Gas Industry.

Through research . . . a better way

A.O.Smith

CORPORATION

TUBULAR PRODUCTS DIVISION

Milwaukee 1, Wisconsin

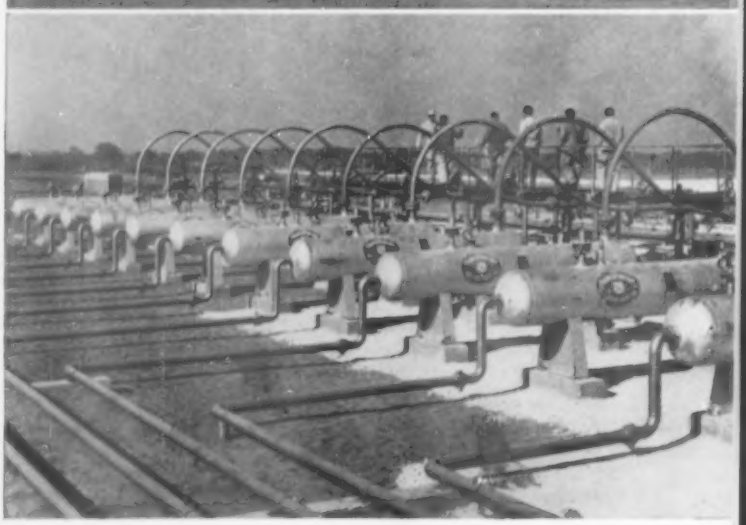
Chicago 4 • Dallas 2 • Houston 2 • Los Angeles 22 • Midland 5, Texas • New Orleans 12 • New York 17 • Pittsburgh 19 San Francisco 4 • Seattle 1 • Tulsa 3 • Washington 6, D.C.

International Division: Milwaukee 1

Whether it's Vertical or Horizontal...

PARKERSBURG SEPARATORS GIVE YOU MAXIMUM SERVICE and PERFORMANCE

Whatever your oil and gas separating conditions, you can select a Parkersburg Separator, fully confident that it will do the job required. Parkersburg's know-how, experience and engineering skill . . . the unlimited range of separator types and sizes . . . the availability of special units is practical assurance that you don't have to compromise service and performance even under the most unusual conditions.



9421

THE PARKERSBURG RIG & REEL COMPANY • PARKERSBURG, WEST VIRGINIA

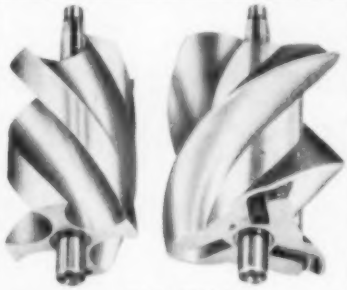
Division of Parkersburg-Aetna Corporation

PRESSURE EQUIPMENT

SEPARATORS • HYRECO • DEHYDRATORS • KNOCKOUTS • SCRUBBERS • TREATERS • HEATERS

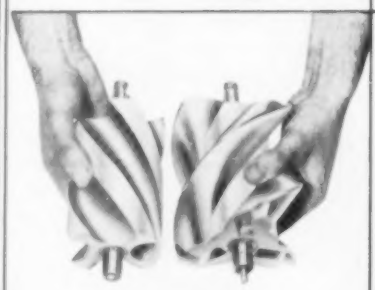
Only BRODIE *BiRotor* METERS offer all these advantages

READILY REPLACEABLE MEASURING UNIT



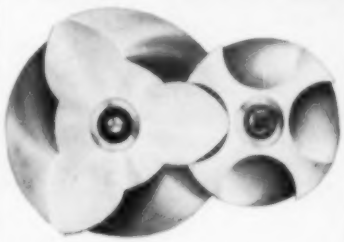
JUST TWO MOVING PARTS

PRECISION DRY ADJUSTMENT



NO METAL TO METAL CONTACT

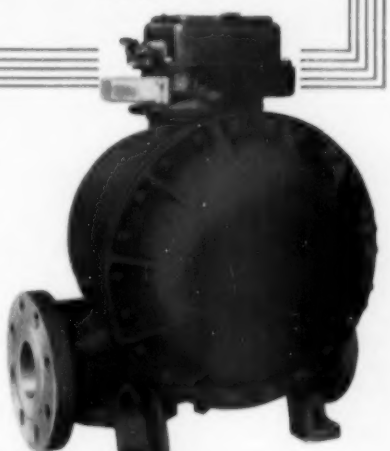
WELDED ALL-STEEL HOUSING



SMOOTH ROTARY PERFORMANCE

It's what's inside that really counts

- Brodie BiRotor Meters are built from the inside out.
- Comprised of compact unit-built assemblies, they are completely interchangeable and fully self-contained.
- Compactness and accessibility permit periodic inspection and maintenance with minimum tie-up of facilities.
- After long continuous service, Brodie BiRotors show little or no measurable signs of wear.
- All this is made possible by the exclusive in-built performance features to be found only in Brodie BiRotor Meters. *Investigate fully today, write for complete details.*



BiRotor—the meter with the readily replaceable measuring unit

BRODIE ALL-STEEL BiRotor TRUE-ROTARY METERS

Ralph N. Brodie Company • ALVARADO & WEST 137th AVE., SAN LEANDRO, CALIFORNIA, U.S.A.

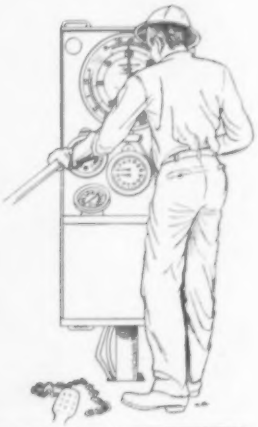
MT. VERNON, N. Y.	CHICAGO 5, ILL.	DALLAS, TEXAS	SEATTLE 9, WASH.	LOS ANGELES 22, CALIF.
550 So. Columbus Ave.	59 E. Van Buren	167 Parkhouse St.	221 9th Ave. N.	5401 E. Sheila Street

REPRESENTATIVES WITH STOCKS AND SERVICE FACILITIES IN ALL PRINCIPAL CITIES

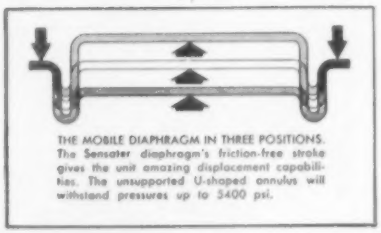
Remarkable new pressure transformer gives you weight-indicator accuracy never before thought possible

The Martin-Decker E-80 SENSATER

with the *MOBILE DIAPHRAGM*



Although the Sensater is a diaphragm-type pressure transformer, it slips in place on the anchor in the same manner as the piston type. Deadline pull on the anchor immediately transmits an accurate signal to the driller's weight-indicator dial.



THE MOBILE DIAPHRAGM IN THREE POSITIONS. The Sensater diaphragm's friction-free stroke gives the unit amazing displacement capabilities. The unsupported U-shaped annulus will withstand pressures up to 5400 psi.

Years of engineering research and on-the-rig testing have culminated in the E-80 *Sensater*, a revolutionary diaphragm-type sensing element for all types of hydraulically operated scales and other weight-indicating devices. Among the first instruments to be geared for Sensater operation were the famous Martin-Decker Type D and E Weight Indicators. The sensitivity of these weight indicators, long recognized as the leaders in oil-drilling instrumentation, has now been infinitely increased. The E-80 Sensater derives its accuracy and sensitivity from a new, wonder-working, mobile diaphragm that, through a novel construction principle develops a stroke equal to a piston's travel. *But*—although it displaces the same amount of fluid as the Type D or E piston—it does so with *no friction whatsoever!*

The Sensater's mobile diaphragm is far different from the diaphragms that most people are familiar with. Unlike ordinary diaphragms, it doesn't deflect, but always moves *with* its backing plate. Consequently, the area pushing against the hydraulic fluid remains constant, always transmitting a true indication. This absence of sag in the diaphragm also precludes any chance of its being ruptured by too much pressure. The diaphragm has a ½" U-shaped annulus which is held in place by the Sensater housing. When the diaphragm makes a stroke the unsupported part of this flexible, U-shaped outer-edge moves with a gentle, rolling motion that is free from stretch and friction.

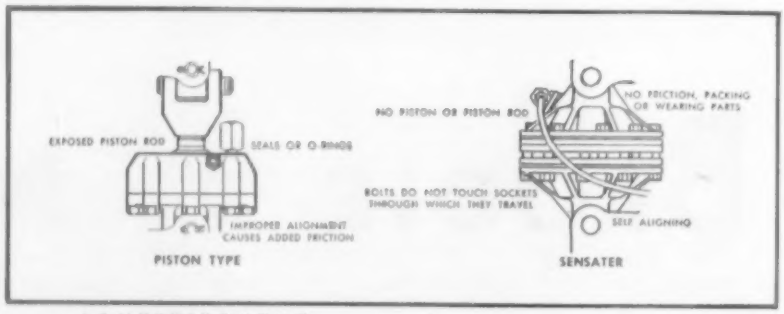
The Sensater opens new vistas of accurate measurement for crane weight indicators, hook scales, drawbar tension indicators, and many other types of hydraulic weighing devices. It transmits direct, no-lag signals to the weight indicator gauge, and does so without O-ring or other friction-causing packing. Nothing to wear out. It is completely self-aligning. Leakproof. It withstands tremendous pressure (up to 5400 pounds per square inch!). Positively unaffected by fluid and temperature changes. The accuracy of the weight indicator reading remains constant even if there is a variation in the amount of fluid in the system. Thus, there are no tricky installations, loading, or calibration problems.

The new E-80 Sensater will be furnished with all Type D and E Weight Indicator Wire Line Anchor combinations. If you choose to purchase a Sensater alone to replace your old piston transformer, the new equipment can easily be slipped into your anchor in a matter of minutes. Its self-alignment principle further simplifies installation and operation.

The engineering miracle of the Sensater is the *friction-free stroke*. There are no problems of friction, wear, or piston-rod corrosion, as are sometimes encountered with cylinder-type pressure transformers. Although the mobile diaphragm develops a stroke equal to a piston's travel, it is so engineered that one component cannot possibly rub against another. In fact, the mobile diaphragm is so free from friction that hysteresis (molecular resistance) can be measured only with delicate laboratory instruments.

The E-80 Sensater is rugged and foolproof. It is designed for years of trouble-free operation and to give you weight indicator accuracy never before thought possible.

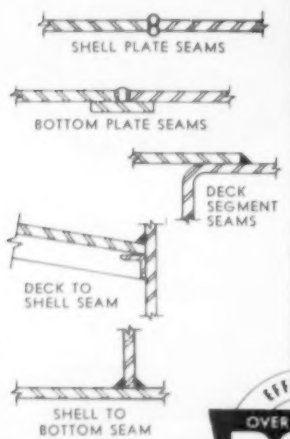
Further information about the Sensater can be had by writing to the Martin-Decker Corporation, 3431 Cherry Avenue, Long Beach 7, California.


EXPOSED PISTON ROD
SEALS OR O-RINGS
IMPROPER ALIGNMENT CAUSES ADDED FRICTION
PISTON TYPE
NO PISTON OR PISTON ROD
NO FRICTION, PACKING OR WEARING PARTS
BOLTS DO NOT TOUCH SOCKETS THROUGH WHICH THEY TRAVEL
SELF ALIGNING
SENSATER

ADVERTISEMENT

Too BIG For "Over-The-Road" Delivery – These Tanks Were..

Typical BS&B Weld Seams



FIELD-WELDED By BS&B!

Many states prohibit trucks from hauling tanks of more than 20 ft. diameter over the highways. If regulations in your area prevent "over-the-road" delivery of large diameter shop welded tanks to your lease, simply specify *field welded* tanks—by BS&B!

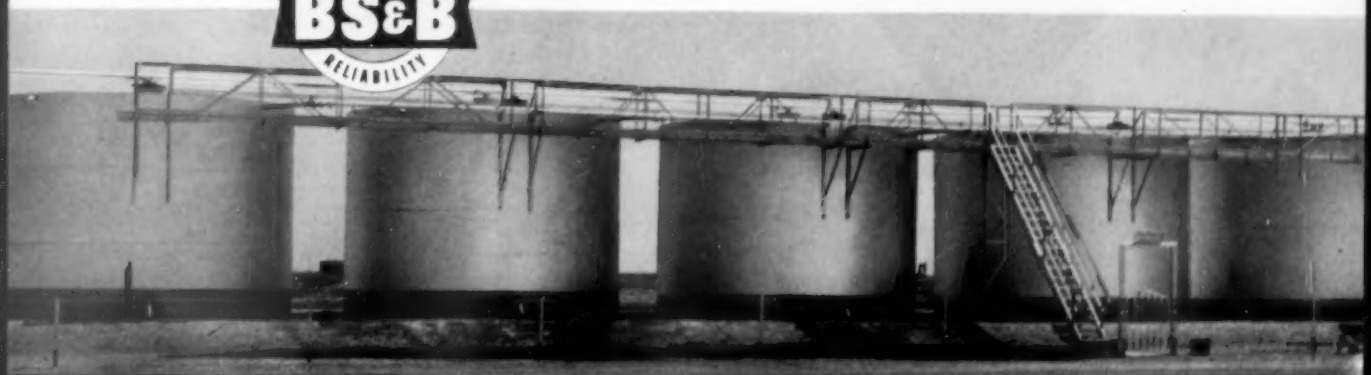
These tanks are fabricated from large, uniform grade C-1012 steel plates, rolled to a specific diameter and butted together with full penetration welds of high quality. The use of flange rolled bottom and deck edges with a 1½" straight flange keeps the joining weld seam out of the knuckle radius, providing maximum strength at all points throughout the tank.

All couplings are heavy recessed, and have full fillet welds on both sides of the tank—except for deck couplings which have welding on the outside of the tank only. All tanks are completely air tested for leaks in the field. Elimination of all leaks and seepage by full penetration weld seams insures a safer installation—and one which will result in more net salable volume of product.

Call your BS&B Representative today—or write for complete information!

EFFICIENCY OVER 60 YEARS BS&B RELIABILITY

BLACK, SIVALLS & BRYSON, INC.
Oil & Gas Equipment Division, Dept. 1-ABA
1708 West Main Street
Oklahoma City, Oklahoma

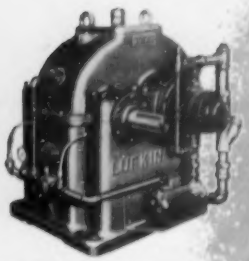


a Name SYNONYMOUS with Quality

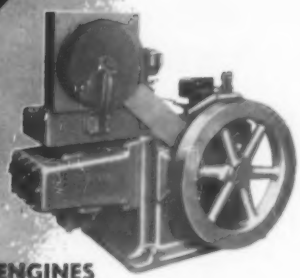
PUMPING UNITS

GEARS

LUFKIN



SPEED REDUCERS AND INCREASERS



GAS ENGINES

TRAILERS

Lufkin FOUNDRY & MACHINE COMPANY

LUFKIN, TEXAS

Branch sales and service Houston, Dallas, New York, Tulsa, Los Angeles, Seminole, Oklahoma City, Corpus Christi, Odessa, Kilgore, Wichita Falls, Casper, Wyoming, Great Bend, Kansas.

Lufkin Equipment in CANADA is handled by

THE LUFKIN MACHINE CO., LTD., 14321 108th Avenue, Edmonton, Alberta, Canada.

At a cost comparable to conventional compressor piping - you can install a GUARANTEED Fluor Pulsation Dampener Piping System*

On new construction we can fabricate and install a complete Fluor Pulsation Dampening Piping System that prevents compressor pipe vibration, at a price almost identical with that of a normal system of conventional piping.

How can we do it? Because we've been in the pipe dampening business a long time. We pioneered the use of piping systems based on scientific acoustical principles applied to fluid flow. We've learned from experience: since 1943 we've put into service 351 Fluor dampening installations throughout the world. We know that when we install a system we can guarantee it without equivocation. In plain words, we know our business.

To save time and costs on these jobs, Fluor maintains two well-equipped pipe fabricating shops—one at Los Angeles and one at Paola, Kansas. Fluor has perfected streamlined techniques for designing and building dampening systems—has the volume production to cut manufacturing costs—possesses the necessary experience to offer a better integrated unit at a price comparable with any normal system.

In addition to getting an economical "packaged" piping system free from vibration, you get many plus advantages in a Fluor designed system: more accurate flow measurement, lower maintenance costs, greater safety to personnel and elimination of vibrational stress on heat exchangers, vessels and related equipment. If the cost of a Fluor dampening piping system is measured by these advantages, then it is certainly one of the most economical buys in compressor plant equipment, today.

Fluor has something very definite to offer you—something far superior to any substitute method of reducing pulsation in pipe. Why not call us for an estimate and find out.

For information on Fluor Pulsation Dampener Piping Systems, write for Bulletin PDS-8501-A.

BE SURE WITH **FLUOR**

THE FLUOR CORPORATION, LTD
LOS ANGELES 22, CALIFORNIA

FLUOR OF CANADA - TORONTO
FLUOR PERUANA, S.A. - LIMA
READ BRIGHTSON - LONDON

ENGINEERS
CONSTRUCTORS
MANUFACTURERS

NEW YORK
CHICAGO
PHILADELPHIA
BOSTON
PITTSBURGH
SAN FRANCISCO
HOUSTON
BIRMINGHAM
TULSA

*U.S. Patents: 2,405,100—2,474,355—2,620,969

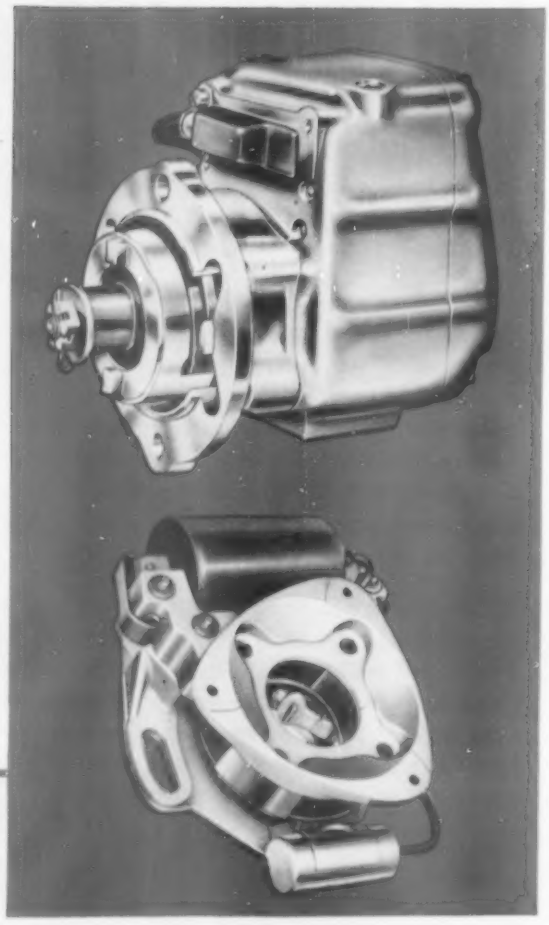
WOULD YOU LIKE
LONGER LIFE
and FREEDOM
from BREAKDOWNS
IN YOUR SMALL ENGINES?

Specify

BENDIX

THE MOST TRUSTED NAME IN MAGNETOS

- √ Simplicity in design.
- √ Waterproof moulded coil.
- √ Lower operating cost.
- √ Minimum lubricating requirement.
- √ Light in weight.
- √ Higher voltage at starting speed.
- √ Constant spark over entire speed range.
- √ Compact and sturdy construction.



Whether you purchase a small engine for outboard, industrial or marine use, today's foremost consideration should be long life and trouble-free performance. Therefore, it will pay you well to insist on Bendix magnetos in the engine you select. For the basic design of Bendix magnetos assures quality performance for *every type* of small engine and *every pricing requirement.* Remember it pays to specify Bendix, the most trusted name in magnetos. Complete information available on request.

Bendix

SCINTILLA DIVISION of SIDNEY, NEW YORK

Bendix AVIATION CORPORATION

FACTORY BRANCH OFFICES: 117 E. Providencia Avenue, Burbank, California • Stephenson Building, 6560 Cass Avenue, Detroit 2, Michigan • 512 West Avenue, Jenkintown, Pennsylvania • Brouwer Building, 176 W. Wisconsin Avenue, Milwaukee, Wisconsin • 582 Market Street, San Francisco 4, California • EXPORT SALES: Bendix International Division 205 East 42nd Street, New York 17, New York

Why the **MICHIGAN*** Tractor Shovel moves bigger yardage – *the Clark Torque Converter*

You can do miraculous things with a MICHIGAN* Tractor Shovel because of *extra power when it's needed*—a result of 3-to-1 torque multiplication in the CLARK Torque Converter.

- **Digging into TOUGH Material**—watch a MICHIGAN *force* its bucket into tough, compacted material: not a "shock" action—but a steady, resistless flow of *increasing power* that puts no punishing strain on the driving shafts and gears. Torque multiplication plus the terrific digging power of the hydraulic bucket rams enable the MICHIGAN to perform unbelievable feats.

- **Maintenance and Down-time reduced to a minimum**—the CLARK Torque Converter eliminates the engine clutch: the weakest link in a conventional power-train and the unit most frequently requiring repair.

- **Make ANY Shift at ANY Time**—with the Torque Converter, driving is as easy as handling your car! Shift into Forward or Reverse, into High or Low range *while moving in either direction* . . . the Torque Converter absorbs shocks.

- **Standard Equipment on All Models**—Clark is first to present a full line of Tractor Shovels with Torque Converter as standard equipment. See the MICHIGAN Tractor Shovel. Watch it in action, demonstrating its astonishing power, speed and maneuverability.

Talk to your MICHIGAN dealer; and send for the MICHIGAN Fact Folio, handy file of specifications and action photos—the coupon gets prompt action.

*A Trademark of Clark Equipment Company

19

CLARK EQUIPMENT

Construction Machinery Division
CLARK EQUIPMENT COMPANY
448 Second Street
Benton Harbor, Michigan

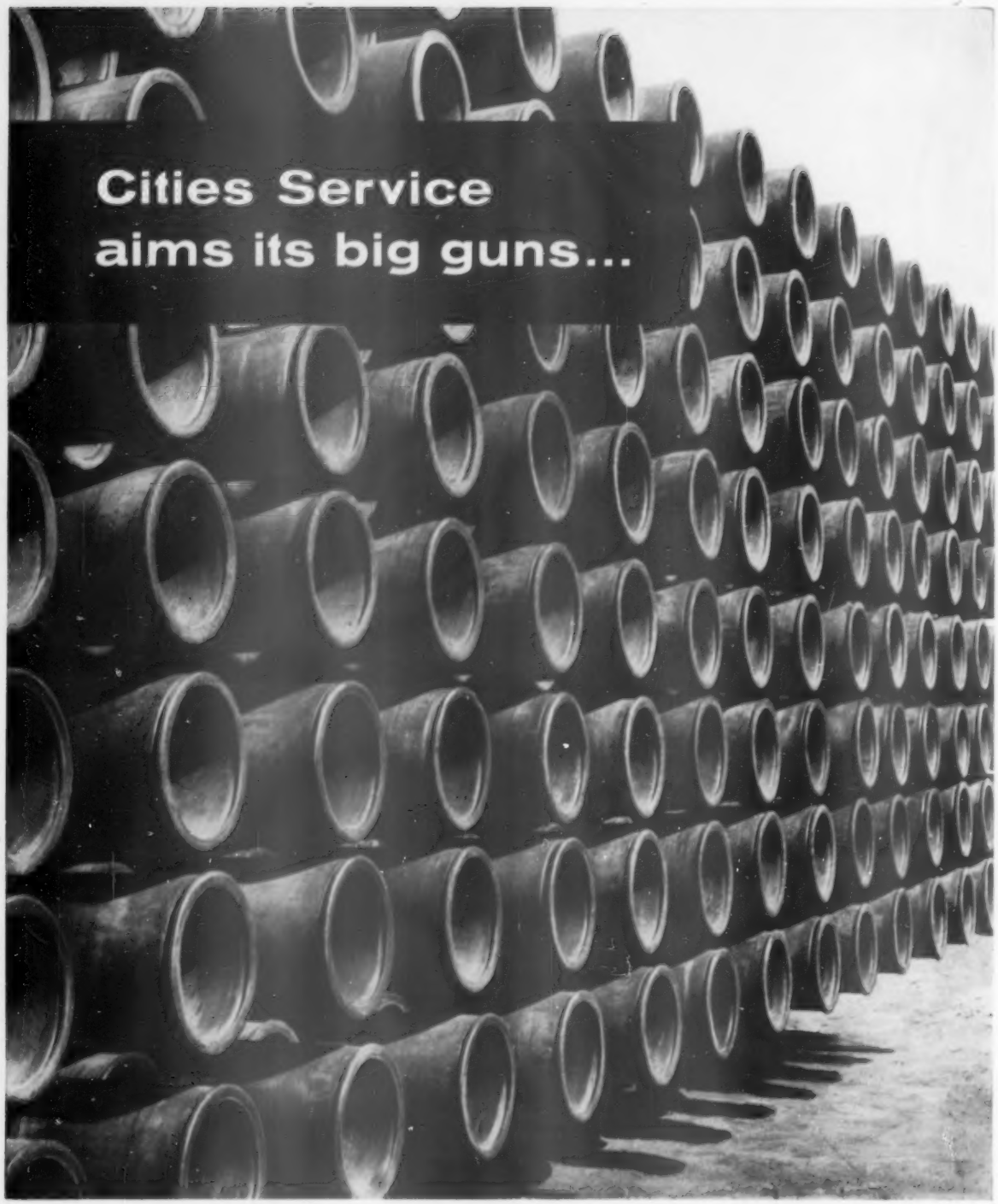
Please send the MICHIGAN Tractor Shovel FACT FOLIO

Name_____ Title_____

Firm_____

Address_____

City_____ County_____ State_____



Acres of casing are mobilized in readiness at a well site. Last year an average of 1⅓ producing wells were drilled every day by

CITIES SERVICE

A Growth Company

reduced to $16.32

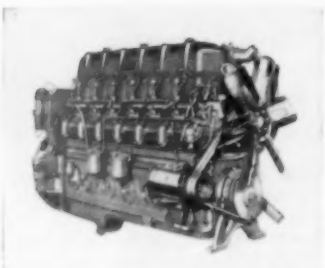
We can't sell you just one. We will sell you 30 to 255 "horses" at the lowest price you can buy diesel power: $16.32 a horsepower for the 6-cylinder model.

If you know diesel, you know there is nothing else like it. A diesel will take on any job you might give to a gasoline engine — and do it for one-third the cost. Not only that, it is simpler to maintain.

Buyers no longer ask *whether* diesel but *which* diesel. Which will deliver the most horsepower for the money? The most horsepower per pound of weight? Which is the easiest to service?

All three questions have one answer: *the P&H Diesel.*

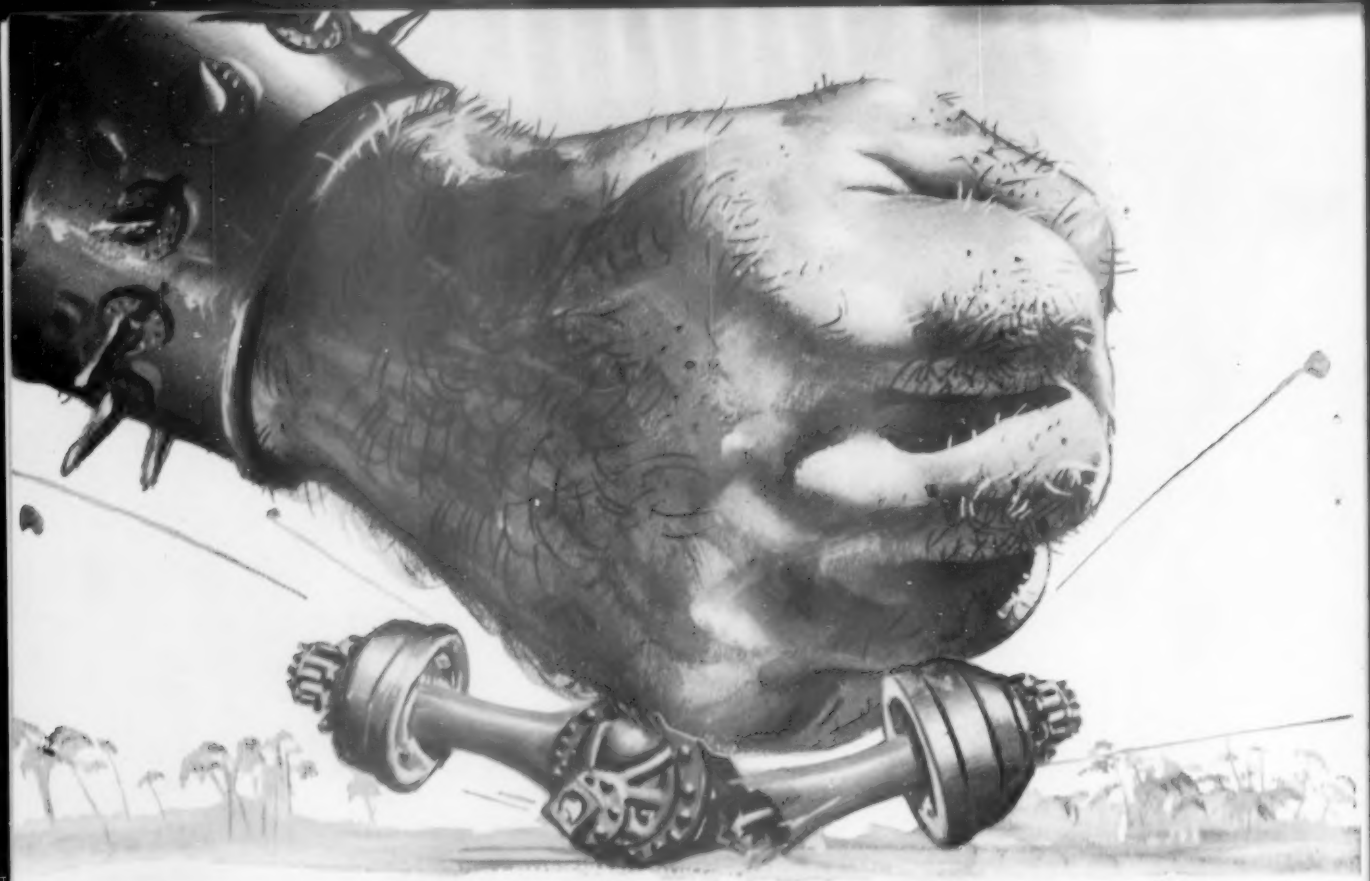
P&H Diesel Engine Division, Harnischfeger Corporation, Crystal Lake, Ill.



Horsepowers, 30 to 255. Two-cycle, 2, 3, 4, 6-cylinder models. Speeds to 1800 rpm. Stationary, mobile, marine. Diesel-generator sets

THE P&H DIESEL

lowest price per horsepower . . .
lowest weight per horsepower



We smash truck axles

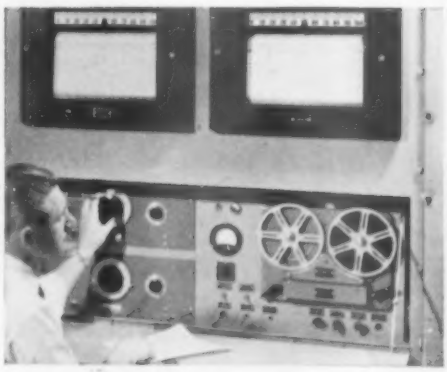
in the new Timken-Detroit indoor proving ground . . . and only Timken has it!

We twist, bend, jounce and jerk them. Duplicate every possible operating condition. Then toss in some "torture-tricks" of our own.

It's calculated destruction! But we know, and can tell you in advance, that a Timken-Detroit axle can take a murderous beating on the job.

Our "Torture Chamber" is a multi-thousand acre proving ground *capsuled into one room!* In it our engineers can put 50 years of experience to work . . . for you . . . experience gained in building axles for trucks, buses, trailers, farm machinery. Stock axles and gearing are subjected *indoors* to any *outdoor* operating condition—under scientific control and analysis.

The result? You enjoy longer axle life; less maintenance, repairs and downtime; lower operating costs, higher profits. Good reasons why Timken-Detroit axles are the choice of the leading manufacturers and owners.



This is our "Torture Tester." He gives axles and gearing the works in the "Torture Chamber." Above him are graphs showing speed and torque performance under any conceivable operating condition. Soft ground . . . twisting roads . . . long grades or fast highway speeds. With special dials, recorders, and electronic devices he actually *drives* the axle with scientific precision—*from his chair!*

How TDA proves axle quality in this "Torture Chamber"

We take an axle out of stock . . . then run a test like twisting the axle shaft 14°, backward and forward—36 times a minute, 24 hours a day, days on end. Or simulate a chuck hole shock every 4 seconds, 24 hours a day for months. Even "bend test" an axle housing for 1,000,000 cycles.

Now get more profitable truck performance than you ever dreamed possible! *Specify...*

TIMKEN-DETROIT 2-SPEED AXLES

because:

1. TDA two-speed double-reduction axles of Hypoid-Helical design provide both fast and slow ratios with two sets of "Man-Size" spur gears of liberal capacity. This simple design eliminates small, complicated arrangements of parts . . . improves performance . . . increases engine and gear life . . . cuts maintenance and repairs . . . fewer service parts required.

2. You get INSTANT, easy shifts . . . fast to slow—or slow to fast.

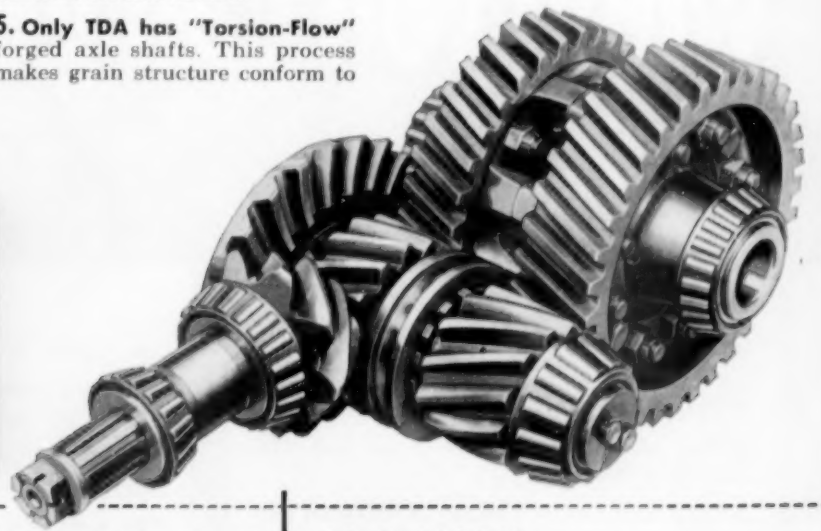
3. TDA's wider range of gear ratios . . . gives you combinations for any hauling requirement. For your present or new truck you can have a fast gear ratio for light loads everywhere—full loads on the level. Slow speed ratio for full loads on hills—for better pulling in "soft going." It all adds up to more profit per load and increased engine life.

4. Hypoid-Helical Gearing increases gear life . . . requires less maintenance. TDA two-speed axles give you a hypoid gear set in the first reduction . . . pinion is bigger . . . more teeth in contact, less load area per tooth. Larger pinion bearings and stronger ring gear. Torque transmitting capacity is increased. Only TDA offers a family of 7 basic axle capacities with interchangeable single speed, single reduction, single speed double reduction and two speed double reduction carriers.

5. Only TDA has "Torsion-Flow" forged axle shafts. This process makes grain structure conform to profile of shaft. Stresses are uniformly distributed throughout shaft—flange failures are practically nonexistent. Exclusive heat-treating formula gives tough, hard outer surface graduated toward center of shaft . . . the ideal combination of axle performance characteristics. TDA "Torsion-Flow" shafts have exclusive guarantee of 100,000 miles or three years, whichever occurs first.

6. Only TDA hot-forged steel axle housings prove in tests to be pound for pound the strongest, most rigid ever built. Actually deflect 20% less than conventional housings of same capacity. Rectangular TDA housing shape provides maximum strength, uniform stress distribution, with minimum weight. Ask about "Life of Vehicle" guarantee.

to bits



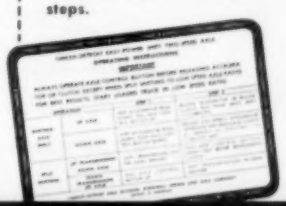
TIMKEN *Detroit* **AXLES**
TIMKEN-DETROIT AXLE DIVISION
ROCKWELL SPRING AND AXLE COMPANY
DETROIT 32, MICHIGAN
The Accepted TDA *Standard*
TRADE MARK REGISTERED

"TORTURE-TESTED" to Save Money on the Job

WORLD'S LARGEST MANUFACTURERS OF AXLES FOR TRUCKS, BUSES AND TRAILERS

Plants at:
Detroit, Michigan
Oshkosh, Wisconsin • Utica, New York
Ashtabula, Kenton and Newark, Ohio
New Castle, Pennsylvania

FREE! Simple information card explains how Timken-Detroit Easy-Power Shift and Two-Speed axle operates when shifting axle only—or split shifting, in 2 easy steps.



Timken-Detroit Axle Division
Rockwell Spring and Axle Company
Detroit 32, Michigan

Please send me the *free information card* mentioned at left, explaining how the Timken-Detroit Easy-Power Shift Two-Speed Axle operates.

Name _____

Company _____

Address _____

City _____ State _____

When you buy welding elbows . . .

Why take less when you can get more?

. . . (and at the same price)

ADVANTAGES OF MIDWEST "LONG TANGENT" ELBOWS

- ★ They save pipe.
- ★ They often eliminate short nipples and their extra welds.
- ★ They save time and money in lining up and clamping pipe and fitting.
- ★ They make it easier to apply slip-on flanges.
- ★ They remove the circumferential weld from point of maximum stress and can be sleeved.
- ★ THEY COST NO MORE THAN OTHER ELBOWS.

As shown in the illustration above, Midwest "Long Tangent" welding Elbows have straight ends equal to ¼ of the nominal fitting diameter (a 12" elbow has tangents 3" long). For the reasons listed at the left, substantial savings are made on many piping systems by using Midwest "Long Tangent" Elbows. For more information about them, write for Catalog 54.

MIDWEST PIPING COMPANY, INC.

Main Office: 1450 South Second Street, St. Louis 4, Mo.

Plants: St. Louis, Passaic, Los Angeles and Boston

Sales Offices:

New York 7—50 Church St. • Chicago 3—79 West Monroe St.
Los Angeles 33—520 Anderson St. • Houston 2—1213 Capitol Ave.
Tulsa 3—224 Wright Bldg. • Boston 27—426 First St.

STOCKING DISTRIBUTORS IN PRINCIPAL CITIES

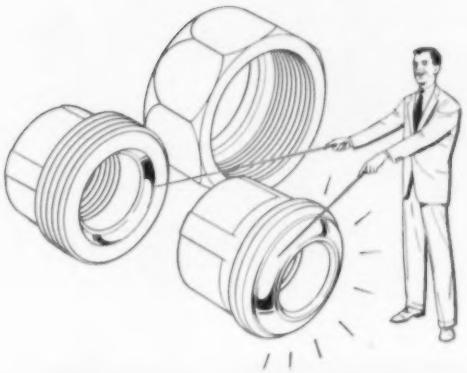
6722

MIDWEST WELDING FITTINGS IMPROVE PIPING DESIGN AND REDUCE COSTS

Now!

A revolutionary new feature...

Hardness-Differential



built into seats of new Union #603

The first steel Union on the market of this type!

Special heat treating now makes possible the Hardness-Differential you've been wanting. *No other Union has this differential.*

The male seat of the new Rockwood Union #603 is specially heat treated to give it a greater degree of hardness than the female seat.

As a result, you get —

No galling in "making up" — longer service.

You also get —

Seats forged in place and double-locked under 100,000 and 400,000-pound pressure. Both seats are made of corrosion-resistant AIST molychrome steel.

Exclusive Rockwood cold forging process results in higher resistance to tough working conditions, expansion and contraction, shock, jar, vibration. Cold forging also results in absolutely interchangeable parts — pipe fitter won't scratch or damage seat in making up in tight places because of plug type ball-to-cone design — eliminates sharp corners or edges.

Exclusive "Rockwoodizing" — a special Rockwood coating process, applied after threading, protects entire union, including threads against corrosion.

Get the seats with the Hardness-Differential built right in. Mail coupon today.

ROCKWOOD SPRINKLER COMPANY

WORCESTER 5, MASSACHUSETTS

ROCKWOOD

ROCKWOOD SPRINKLER COMPANY
628 Harlow Street
Worcester 5, Mass.

Please send me prices and further data on the new Rockwood Union #603. I would also like the name of the nearest Rockwood distributor.

Name .....

Title .....

Company .....

Street .....

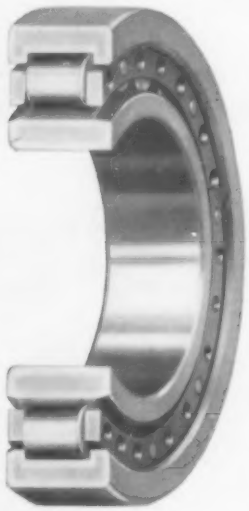
City ..... Zone ..... State .....

WHATEVER YOUR ROLLER BEARING APPLICATION

specify BOWER!

Earthmovers, jet turbine engines, rolling mill equipment, truck axles—you name it! Bower builds a complete line of tapered, straight and journal roller bearings including a size and type to fit *your* product. What's more, these dependable bearings have *proved* themselves in virtually every conceivable type of application. Their built-in quality, skillful engineering and advanced design features provide such important bearing advantages as reduced wear, longer life and lower maintenance requirements. Let a Bower engineer give you full details on the complete Bower line.

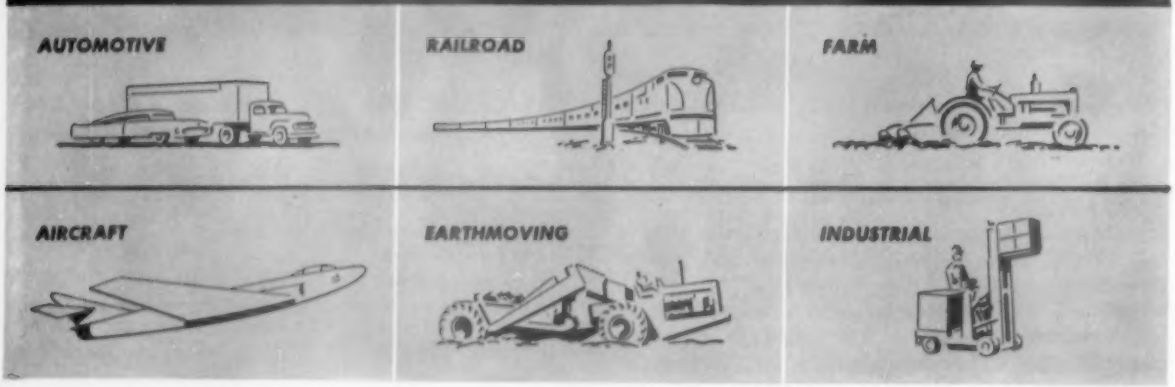
BOWER ROLLER BEARING COMPANY
DETROIT 14, MICHIGAN



BOWER TAPERED ROLLER BEARINGS INCORPORATE ADVANCED SPHER-O-HONED DESIGN! Spherically generated roll heads and higher flange with larger, two-zone contact area reduce wear, improve roller alignment and virtually eliminate "end play." This helps hold adjustment and pre-load longer and better. Larger oil groove provides positive lubrication.

BOWER STRAIGHT ROLLER BEARINGS ARE BUILT TO CARRY MAXIMUM LOADS! Integral two-lip race increases rigidity—keeps rollers in proper alignment at all times. Steel cage allows free movement of rollers between races during normal operation. High-grade alloy-steel rollers and races are precision-ground for quieter, smoother operation.

A COMPLETE LINE OF TAPERED, STRAIGHT AND JOURNAL ROLLER BEARINGS
for every field of transportation and industry



BOWER
ROLLER BEARINGS
SPHER-O-HONED

New Chevrolet Trucks

deliver more power, more ruggedness, for less money!

Making sure the truck you buy has plenty of power and chassis ruggedness is good business in any man's book. Getting the money-saving extra power and ruggedness of Chevrolet trucks is *better* business in any man's book*keeping*.

EXTRA POWER MEANS BIGGER SAVINGS

No doubt about it, the extra power you get from new high-compression Chevrolet truck engines means you're going to pay out less for gasoline. Over a year, that adds up to a sizeable savings. Increased power brings time-saving benefits, too—greater acceleration and hill-climbing ability . . . you haul faster, get the job done quicker!

GREATER RUGGEDNESS CUTS OPERATING COSTS

Heavier axle shafts and wheel hubs on two-ton models; bigger, more durable clutches on light- and heavy-duty models; stronger, more rigid frames on all models. These features pay off in extra-low upkeep costs . . . extra miles of dependable truck life.

But these *while-you-drive* savings aren't all, by a long shot. You even save *when you buy*. For Chevrolet is America's lowest-priced line of trucks. Stop by your Chevrolet dealer's soon to see the "savingest" trucks on the road. He'll show you models ideally suited to your job, with facts to prove you'll get more for your money. Chevrolet Division of General Motors, Detroit 2, Mich.

CHEVROLET

MOST TRUSTWORTHY TRUCKS ON ANY JOB!

CHEVROLET ADVANCE-DESIGN TRUCK FEATURES

THREE GREAT ENGINES—The new "Jobmaster 261" engine* for extra heavy hauling. The "Thriftmaster 235" or "Loadmaster 235" for light-, medium- and heavy-duty hauling. **NEW TRUCK HYDRA-MATIC TRANSMISSION***—offered on ½-, ¾- and 1-ton models. Heavy-Duty **SYNCHRO-MESH TRANSMISSION**—for fast, smooth shifting. **DIAPHRAGM SPRING CLUTCH**—improved-action engagement. **HYPOID REAR AXLE**—for longer life on all models. **TORQUE-ACTION BRAKES**—on all wheels on light- and medium-duty models. **TWIN-ACTION REAR WHEEL BRAKES**—on heavy-duty models. **DUAL-SHOE PARKING BRAKE**—greater holding ability on heavy-duty models. **NEW RIDE CONTROL SEAT***—eliminates backrubbing. **NEW, LARGER UNIT-DESIGNED PICKUP AND PLATFORM STAKE BODIES**—give increased load space. **COMFORTMASTER CAB**—offers greater comfort, convenience and safety. **PANORAMIC WINDSHIELD**—for increased driver vision. **WIDE-BASE WHEELS**—for increased tire mileage. **BALL-GEAR STEERING**—easier, safer handling. **ADVANCE-DESIGN STYLING**—rugged, handsome appearance.

**Optional at extra cost. Ride Control Seat is available on all cabs of 1½- and 2-ton models, standard cabs only in other models. "Jobmaster 261" engine available on 2-ton models, truck Hydra-Matic transmission on ½-, ¾- and 1-ton models.*

H.P. pipe gaskets like these *made to your order* by gasket specialists...

...to save you both time and money

When you need metallic gaskets for high pressure piping, put the job up to Johns-Manville Goetze Gasket specialists. You benefit in many ways:

You get the exact gaskets you need for maximum efficiency under *your* operating conditions, tailor-made to fit *your* equipment. You get the savings in cost made possible by intensive specialization and modern production tooling. And you get the full benefit of over sixty years' experience in designing specialized metallic gaskets for industry's most complex sealing requirements.

Typical styles of Johns-Manville Goetze Gaskets that have been made to order for high pressure piping service are shown above. The flare type gasket with bellows action and the solid flare type are particularly suited for pressures above 5000 psi; the profile and V-Tite gaskets are generally used for lower pressures. Each of these is fabricated to extremely close tolerances. Other styles can be made to any desired cross section to meet your individual requirements.

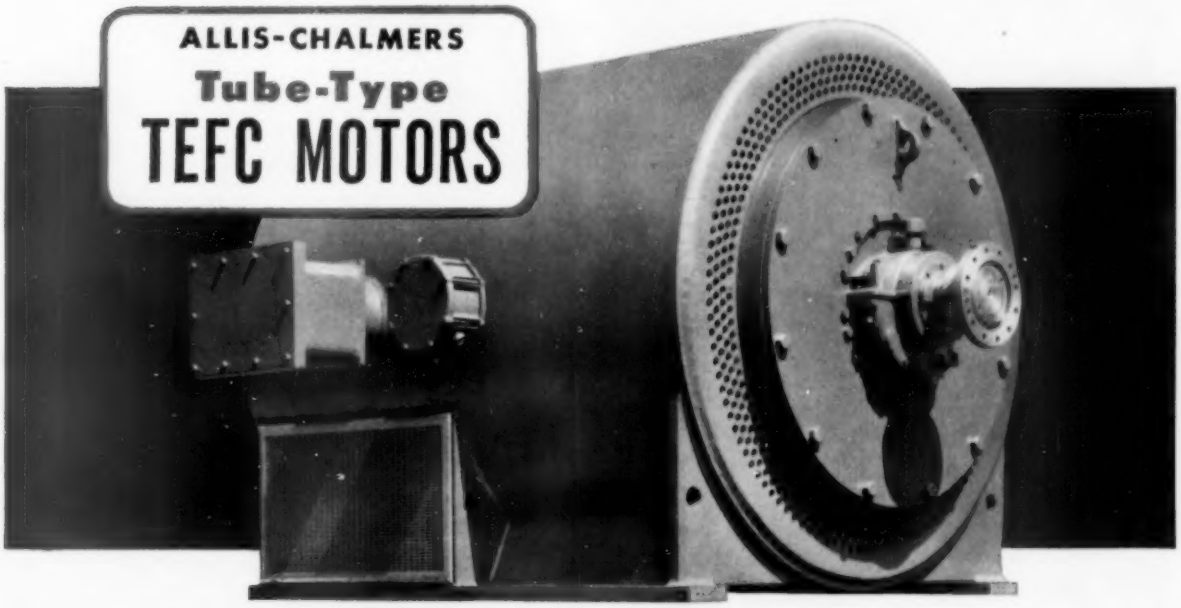
For more information about Johns-Manville Goetze Gaskets, write for your copy of Catalog PK-35A. Or send us your drawing or template for an immediate quotation. Address: Johns-Manville, Box 60, New York 16, N. Y.

Johns-Manville *Goetze* GASKETS

THERE'S A JOHNS-MANVILLE PACKING AND GASKET FOR EVERY SERVICE

NOW 1250 Hp – 1780 Rpm Underwriters' Approved

for Class I, Group D Service



Allis-Chalmers explosion-proof motors as large as 1250 hp, 2300 volts, 1780 rpm are now available with Underwriters' Laboratories, Inc. labels for operation in Class I, Group D hazardous locations.

Previous to recent tests, the Allis-Chalmers Underwriter-approved motor line included ratings up to 800 hp, 3600 rpm for operation in Class I, Group D and Class II, Group F and G locations. Now, with the design used for larger ratings also Underwriters' test-proved, Allis-Chalmers can supply explosion-proof motors in other ratings required by industry.

Explosion-Proof Plus

Operation-proved by TEFC motors totaling over a quarter million horsepower, the A-C tube-type air-to-air heat exchanger design combines safety and maximum operating economy. Self-cleaning action cuts maintenance. Full internal air circulation lengthens insulation life. Complete enclosure protects stator core and other electrical parts from dirt and corrosion.

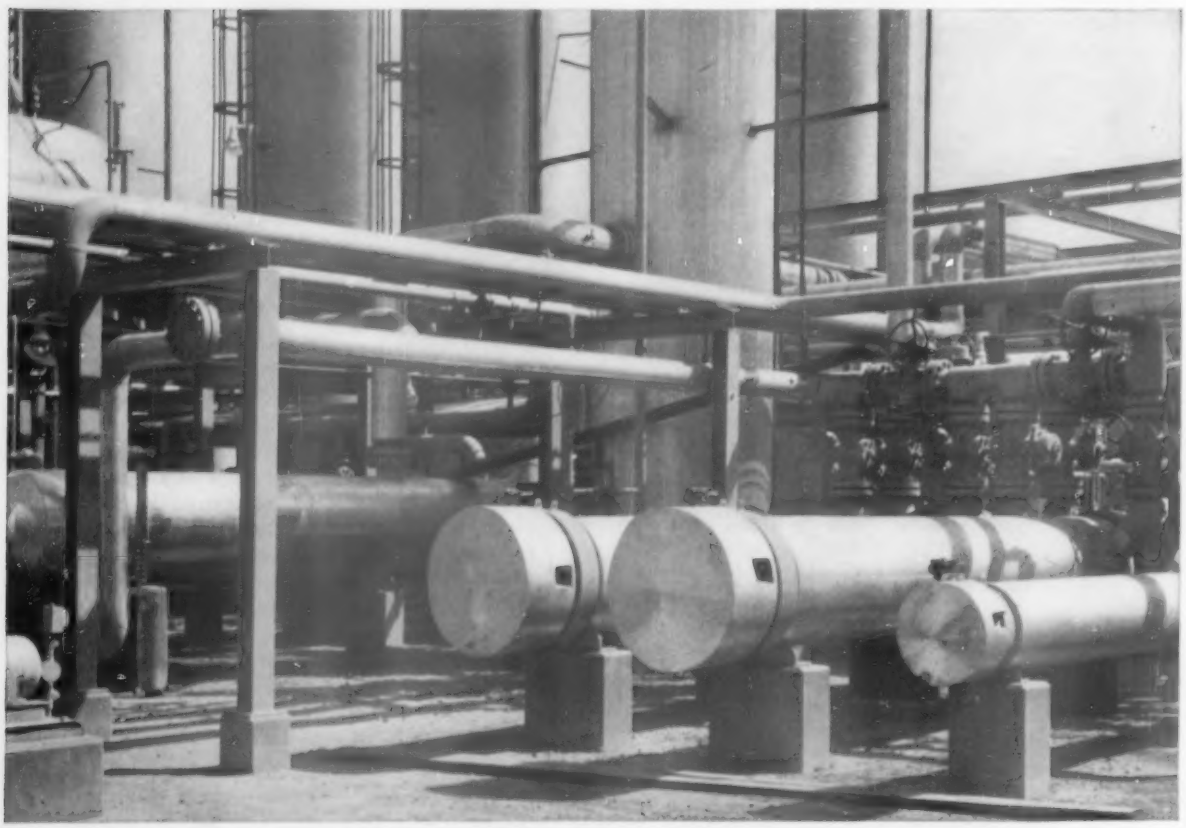
For approved motors for hazardous dust and gas locations, contact your A-C representative, or write to Allis-Chalmers, Milwaukee 1, Wisconsin.

A-4456

ALLIS-CHALMERS

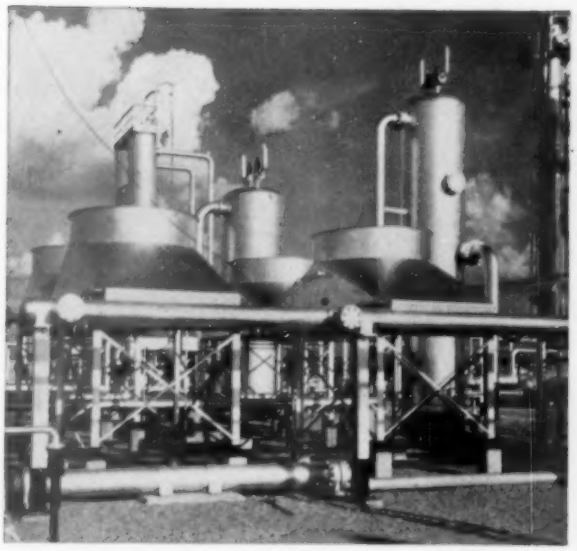
Profit-building answers to Modern

...examples of the wide variety of heavy-metal equipment designed and built by Alco to meet today's demands in petroleum and petrochemical processing . . . results of **Alco Experience** . . . gained through many years of designing and building heavy-metal equipment for refining and processing companies the world over . . . and **Alco Facilities** . . . capable of handling economically an extremely wide range of metal-fabricating operations . . . of meeting strictest customer requirements.

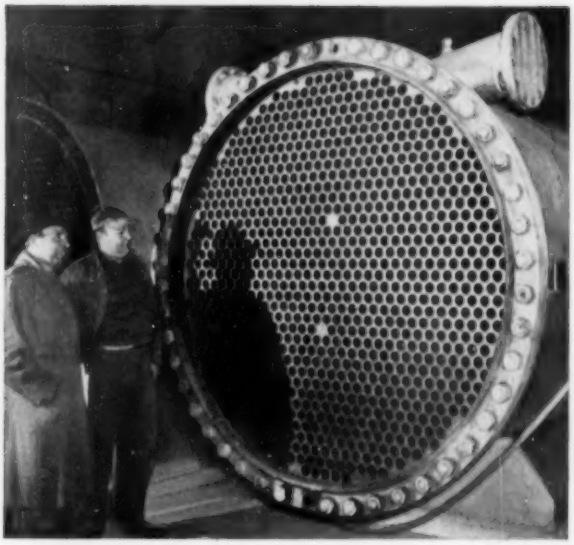


ALCO FEED EXCHANGERS AND REBOILER heat the product stream to the de-ethanizer column at Lion Oil Company's Diamond M-Sharon Ridge gasoline plant in Scurry County, Texas, "The richest county west of Fort Worth." All shell-and-tube heat-transfer equipment at this new, 50,000,000 cu ft-capacity plant is Alco built.

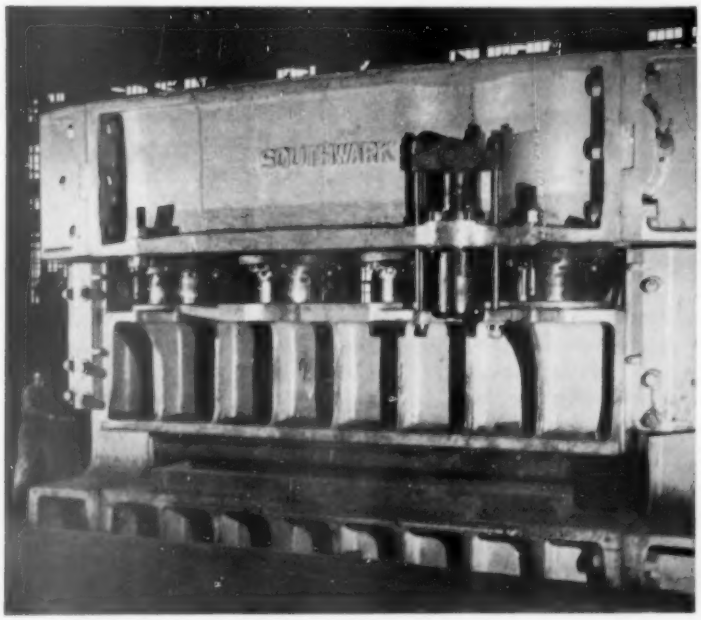
Processing problems



ALCO AIRCOOLERS help cut cooling costs at Sun Oil Company's pressure maintenance station at Allison Ranch, Texas. These modern, high-efficiency units are ideal answers to cooling problems caused by insufficient water supply or high relative humidity affecting evaporative units.



EXHAUST GAS COOLERS custom-engineered by Alco are part of the extensive facilities for testing supersonic aircraft, guided missiles and aircraft engines at the new Arnold Engineering Development Center at Tullahoma, Tenn. Also installed at the Center are 25,000 ft of Alco Steel Pipe.



SCORES OF PROFIT-BUILDING ANSWERS to modern processing problems have taken shape on this large press at Alco's 31-acre Dunkirk plant. This is just one of the many special machines that enable Alco to meet your strictest specifications—quickly and economically.

How about your own processing problems? Is heavy-duty equipment a factor? If so, contact your nearest Alco Products sales representative today—as the first step toward profit-building answers. Offices in Dunkirk, New York, Chicago, Los Angeles, Kansas City, Houston, Tulsa, and Beaumont.

ALCO
PRODUCTS

AMERICAN LOCOMOTIVE COMPANY
Sales and Service Offices in Principal Cities

when Diamond Chromates were added!

You have had to ante up many times for the staggering costs of corrosion. Do you know that in many cases these costs can be materially reduced? Here are some actual figures: One producing well was showing maintenance costs averaging $600 per month. Then DIAMOND Chromates were introduced.

Maintenance costs dropped to an average of $100 per month! A saving of $500 a month! Think how much you would save if all your losses from corrosion were cut in the same proportion.

You can easily get more facts and figures and the benefit of practical experience and technical know-how as well. Just call your DIAMOND representative. He will be glad to tell you of the many other cost and time saving applications for DIAMOND chemicals in the petroleum industry.

Call your nearby DIAMOND Sales Office or write DIAMOND ALKALI CO., 300 Union Commerce Building, Cleveland 14, Ohio.

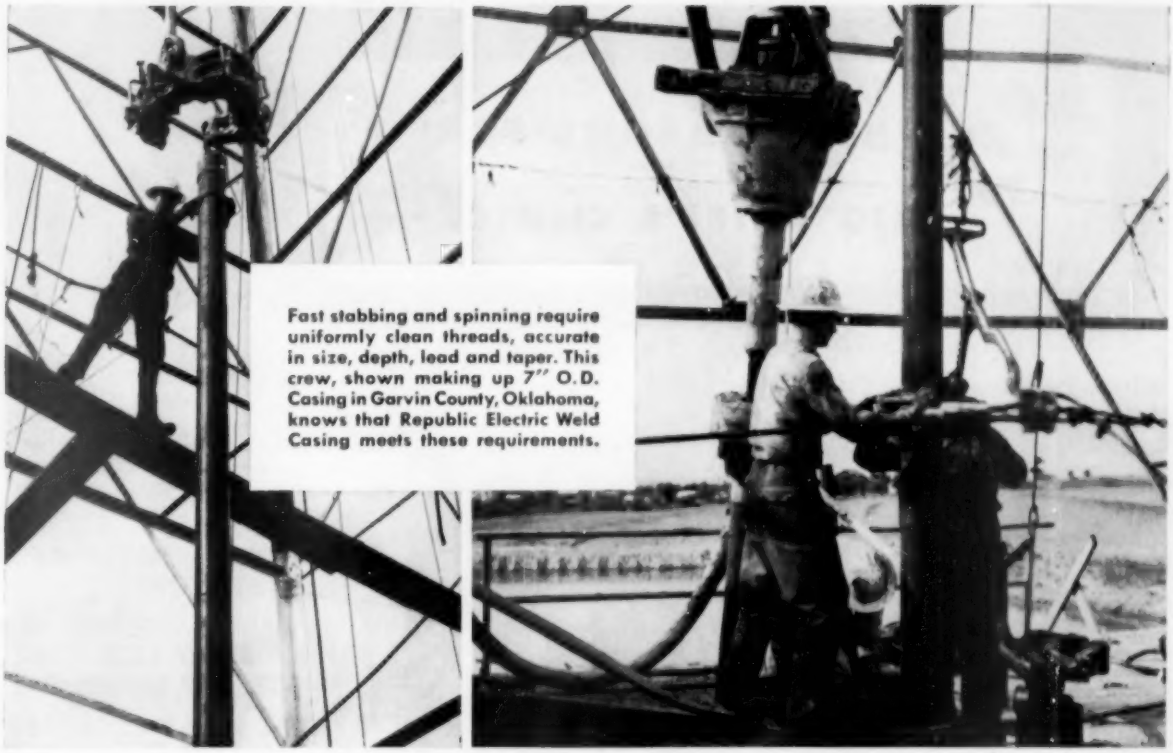
DIAMOND ALKALI COMPANY
CLEVELAND 14, OHIO

DIAMOND SALES OFFICES:

New York,
Philadelphia,
Pittsburgh,
Cleveland,
Chicago,
Cincinnati,
St. Louis,
Memphis,
Houston.

Diamond Chemicals for the Oil Industry

DIAMOND ALKALI CHEMICALS



Fast stabbing and spinning require uniformly clean threads, accurate in size, depth, lead and taper. This crew, shown making up 7" O.D. Casing in Garvin County, Oklahoma, knows that Republic Electric Weld Casing meets these requirements.

Where strings hang by threads ... operators depend on REPUBLIC ELECTRIC WELD CASING AND TUBING

The longer the string, the heavier the strain on the threads in each joint. And one weak joint can spell disaster, shoot costs sky high.

Operators avoid expensive failures by specifying dependable Republic Electric Weld Casing and Tubing. They know that these products are consistently uniform in wall thickness, size, concentricity and diameter. They know this assures threads that have uniform depth of tough steel at every point under the root line to resist joint failure.

Made from high-ductility steel, Republic Electric Weld Casing is fully normalized for uniform structure, then cold sized for high yield strength. And its high resistance to collapse provides added protection in the hole.

Republic's Normalized Electric Weld Casing and Tubing, standards in the industry for over 25 years, are available in grades H-40 and J-55; in sizes ranging from 2⅜" through 13⅜" O.D.

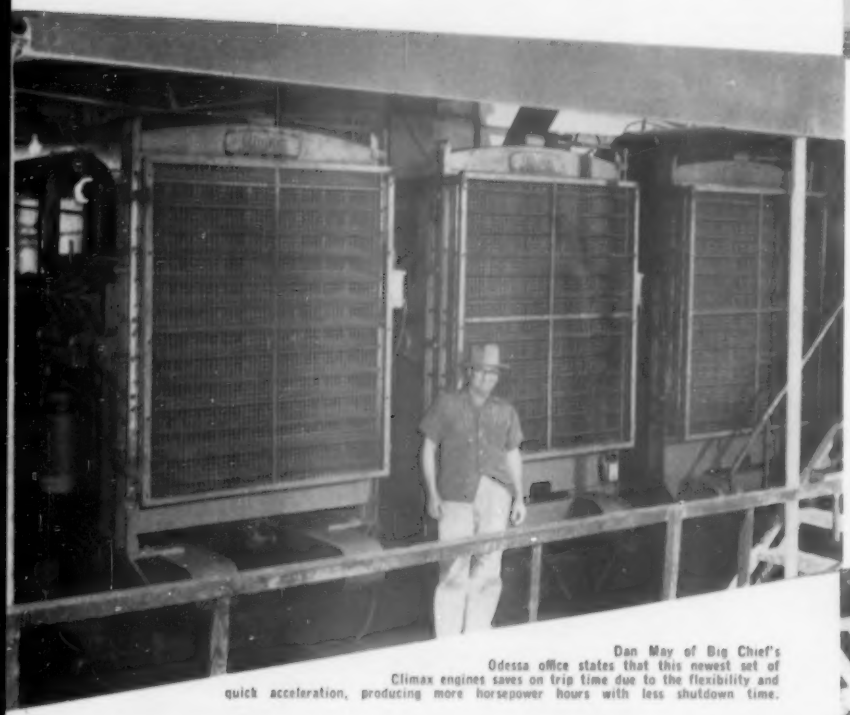
Republic Makes Both—In addition to Electric Weld, Republic is now a major producer of Seamless Casing and Tubing. Produced in the world's most modern seamless mill, Republic Seamless quality is carefully guarded by the latest in precision equipment and techniques. Made in grades J-55 and N-80; sizes from 2⅜" through 9⅝" O.D. For complete information, call your nearest Republic sales office. Or write to:

REPUBLIC STEEL CORPORATION
GENERAL OFFICES • CLEVELAND 1, OHIO
Export Department: Chrysler Building, New York 17, New York

REPUBLIC
CASING AND TUBING
Electric Weld and Seamless

Other Republic Products include Line Pipe—Steel and Plastic Pipe—Carbon, Alloy and Stainless Steels—Studs, Bolts and Nuts—Heat Exchanger Tubes

3 BIG REASONS FOR BIG CHIEF'S CHOICE

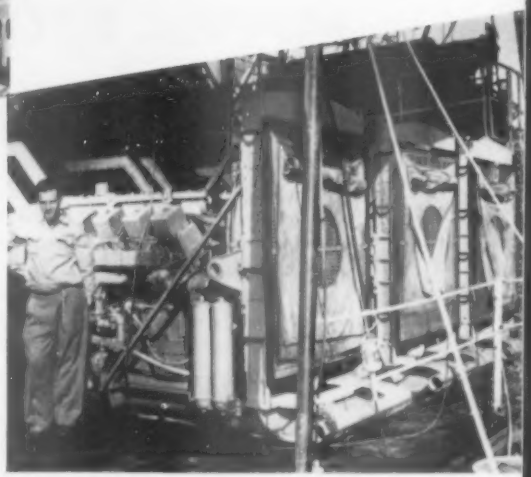


Dan May of Big Chief's Odessa office states that this newest set of Climax engines saves on trip time due to the flexibility and quick acceleration, producing more horsepower hours with less shutdown time.

1. QUICK ACCELERATION TO SAVE ON RIG TIME.

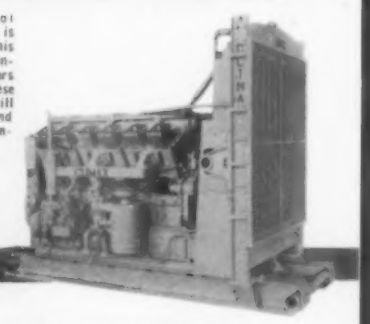
2. RUGGED, DURABLE CONSTRUCTION TO KEEP OPERATING COST TO A MINIMUM.

3. PERFORMANCE THAT MEANS LESS DOWN TIME WITH LONGER PERIODS BETWEEN OVERHAULS.



Since Big Chief put its first Climax-powered rig in operation years ago, the performance record set by these engines has been outstanding. That's why Big Chief has chosen Climax Blue Streak for its heaviest rigs. They know they can depend on the quick acceleration of Climax engines to save on trip time; on the rugged, durable construction to keep operating costs to a minimum. A Climax engine is an investment that pays off in performance now and in the future. Let your nearest Climax distributor tell you about Climax power for your rigs.

Alvin Traugott, tool pusher for Big Chief, is high in his praise of this first set of Climax engines put in service years ago by his company. These Climax engines are still operating efficiently and economically after a number of years service.



Climax BLUE STREAK ENGINES

CLIMAX ENGINE AND PUMP MFG. CO.

208 SO. LA SALLE ST. CHICAGO 4, ILL.

FACTORY CLINTON, IOWA • DISTRICT OFFICE 155 CONTINENTAL AVE. DALLAS 7, TEXAS

DISTRIBUTORS

Harry Cornelius Co.
Albuquerque, N. M.

Diesel Equipment Co.
Wichita & Great Bend, Kans.

Diesel Power Co.
Oklahoma City & Tulsa, Okla.

United Tool Co.
Shreveport, La.

Vern Walton Co.
Coolidge & Casa Grande, Ariz.

Wilson's Engine & Equipment Co.
Bakersfield & Long Beach, Calif.

Lewis Diesel Engine Co.
Memphis, Tenn., and Little Rock, Ark.

Stewart & Stevenson Services, Inc.
Houston and 8 Texas Branches

Equipment Supply Co.
El Paso, Tex.

Diesel Power, Inc.
Plainview, Tex.

PETROLEUM CHEMICALS DIVISION
NEWS

August ★ One of a Series of Interest to the Petroleum Industry ★ 1954

Research Paves Way for Production and Employment

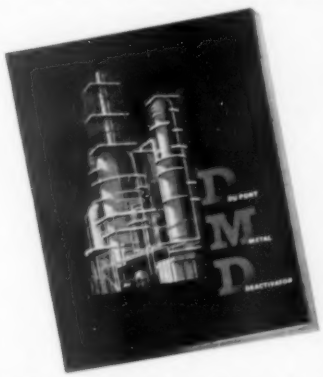
Over the past quarter century, for every dollar Du Pont has spent for laboratory research, it has spent three dollars in productive facilities.

Research in the same period cost $475 million, exclusive of buildings and equipment. And employment soared from 38,000 to more than 90,000.

During the same span, expenditures for new plants and facilities amounted to $1,400 million. This is a ratio of three production dollars for one research dollar.

New Booklet on Du Pont Metal Deactivator

Many refiners are giving increased attention to the problem of the effect of metals on gum formation. To aid them in solving this problem, the Du Pont



Petroleum Chemicals Division offers a comprehensive new booklet which discusses the aspects of gum prevention.

The booklet traces the sources of metallic contamination. And findings of a recent service station survey on the prevalence of copper and gum in gasolines are included. There are also many helpful hints and detailed instructions on combatting gum formation with Du Pont Metal Deactivator.

Application and Costs

The booklet discusses methods of adding Du Pont Metal Deactivator and quantities needed to prevent metallic reaction. And it presents a cost study on the use of DMD. Other valuable information includes chemical reactions, handling and shipping. In all, there are 20 pages of facts with answers to practically any question you may have regarding the use of DMD.

The new booklet is yours on request from any Du Pont representative or regional office.

Mileage by the roomful to test automotive fuels and lubricants

How is gasoline efficiency affected by high-speed, high-temperature operation?

What happens to a lubricant in the hectic start-and-stop maneuvering through city traffic?

Questions like these become more important today as high-speed superhighways weave a network across the country, and the tangle of city traffic grows more knotty.

DEVELOPING FUELS AND LUBRICANTS FOR TOMORROW'S CARS calls for extensive road testing. To accelerate this work, the Du Pont Petroleum Laboratory has brought the highway indoors with this ingenious chassis dynamometer.

The new chassis dynamometer at Du Pont's Petroleum Laboratory gives interesting answers. It is an important source of information for the automotive engineers taking part in Du Pont's research concerned with additives designed to improve fuel and lubricant performance.

How It's Done

Speeds up to 90 mph can be simulated on the dynamometer. Radiator windage can be synchronized to the simulated speed of the car. Inertia flywheels create road conditions by varying "load."

Five flywheels can exert a load in multiples of 500 pounds up to two and

ADVERTISEMENT—Prepared for the Petroleum Chemicals Division of E. I. du Pont de Nemours & Company (Inc.)

OVER

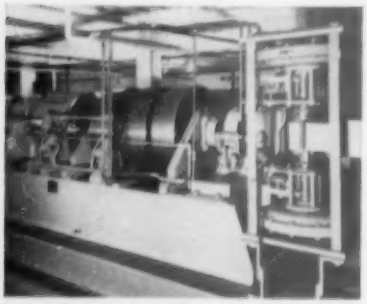
DU PONT

PETROLEUM CHEMICALS DIVISION
NEWS

DU PONT

CONTINUED *Dynamometer*

three quarters tons. Engineers operate this versatile setup from a central control panel where detailed data on test factors are also recorded.



THE INERTIA FLYWHEELS, a useful feature of the Petroleum Laboratory's chassis dynamometer, simulate "load" on the car or truck being tested. The two large wheels on the right represent 2,000 pounds each, the next one is 1,000 pounds, and a 500-pound wheel is shown at the left.

THIS FAN is used to generate windage through the car's radiator. It allows the dynamometer to simulate actual radiator operating conditions, at speeds up to 90 mph.

Results

Information learned from tests in Du Pont's new chassis dynamometer will aid in matching vehicles, fuels and lubricants to the changing patterns of modern driving conditions.

As data from these tests are collected and evaluated, they will be made available to the petroleum and automotive industries.

Manager of New San Francisco District

JOSEPH G. EVANS

Because of increasing activity on the Pacific Coast, and as an added service to refiners, a new district has been created by the Du Pont Petroleum Chemicals Division's West Coast Region.

Assigned to the post as manager of the San Francisco District is Joseph G. Evans who joined Du Pont in December 1951.

Mr. Evans is a graduate of Texas A & M and started with Du Pont as a sales-service representative of the Petroleum Chemicals Division in Tulsa, Oklahoma.

Previous to this he was Development Engineer for the Standard Stoker Company of Erie, Pennsylvania, and later formed his own company handling specialized industrial chemicals and automotive lubricants.

Mr. Evans spent three years in the Pacific as an officer in the Naval Submarine Service during World War II. He was later recalled to active duty during 1950-1951 to serve on the destroyer U.S.S. McCaffery off Korea.

Du Pont additive improves diesel fuel production 4 ways

You may know Du Pont Fuel Oil Additive No. 2 as an effective stabilizer and dispersant for distillate heating oils. But do you also know that F.O.A. No. 2 does some remarkable things when added to diesel fuel?

It permits blending of cat-cracked and straight-run stocks. Refiners get more flexibility and greater capacity in diesel fuel production.

Certain amounts of heavy distillate fuel oils treated with Fuel Oil Additive No. 2 can be added to diesel fuel without affecting filterability. In this way the additive permits upgrading of heavy oils.

It reduces particle size of insoluble residues, and retards their formation as well. Result—F.O.A. No. 2 helps to end clogging of diesel filter screens.

The fourth advantage of F.O.A. No. 2 in diesel fuels is that, being ashless, it simplifies the problem of meeting ash specifications. Since it leaves no combustion chamber deposits, it does not contribute to exhaust sparks.

Storage tests indicate that this highly concentrated chemical additive gives most satisfactory results when added to freshly prepared stocks at the refinery.

LITERATURE AVAILABLE

Here is a partial listing of the bulletins, reports, booklets, technical papers and aids available to you through any of the Du Pont Petroleum Chemicals Division regional offices listed below:

Du Pont Fuel Oil Additive No. 2—A 12-page bulletin describing this ashless stabilizer and dispersant which prevents clogging of fuel oil screens . . . A-6522

Du Pont Metal Deactivator—A new, comprehensive, 20-page booklet which discusses every aspect of copper contamination and methods of metallic gum prevention using Du Pont Metal Deactivator, A-7300

Film Library—A new catalog, listing films which are available for oil company use. This listing includes the Du Pont "Cavalcade of America" TV library . . . A-7549

DU PONT

Better Things for Better Living
. . . through Chemistry

Petroleum Chemicals

E. I. DU PONT DE NEMOURS & COMPANY (INC.)
Petroleum Chemicals Division • *Wilmington 98, Delaware*

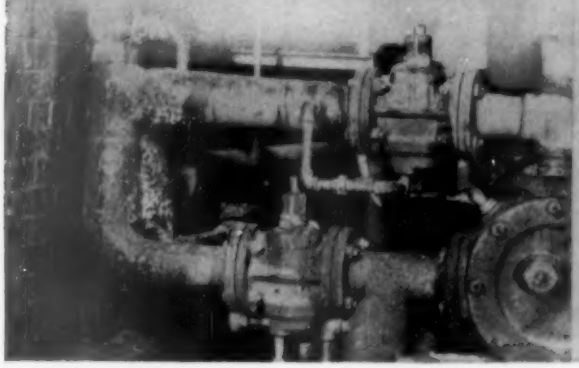
Regional Offices:
NEW YORK, N. Y.—1270 Ave. of the Americas Phone COlumbus 5-3620
CHICAGO, ILL.—8 So. Michigan Blvd. Phone RAndolph 6-8630
TULSA, OKLA.—1811 So. Baltimore Avenue Phone Tulsa 5-5578
HOUSTON, TEXAS—705 Bank of Commerce Bldg. Phone PReston 2857
LOS ANGELES, CALIF.—612 So. Flower St. Phone MAdison 5-1691
IN CANADA: Du Pont Company of Canada Limited—Toronto, Ont.—Montreal, Que.—Calgary, Alta.
OTHER COUNTRIES: Petroleum Chemicals Export—Nemours Bldg., 6539—Wilmington 98, Del.

ADVERTISEMENT—Prepared for the Petroleum Chemicals Division of E. I. du Pont de Nemours & Company (Inc.)

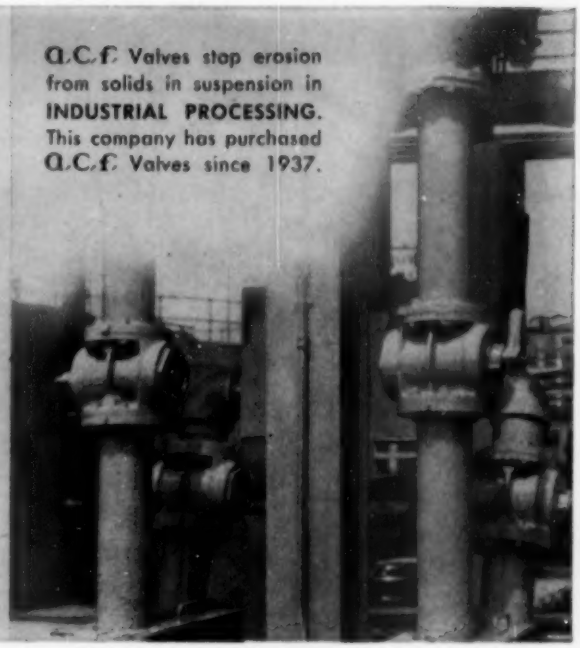
A-7724

Printed in U. S. A.

The full pipe area of a.C.f. Cylindrical Plug Valves guarantees smooth flow of viscous lading, such as found in this **ROOFING ASPHALT PLANT.** Since the Valve has equivalent area to the pipe, there is no retarding of the free flow of material.

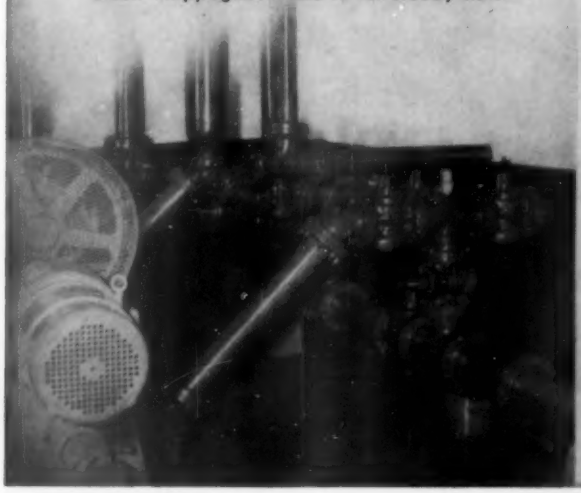


a.C.f. Valves stop erosion from solids in suspension in **INDUSTRIAL PROCESSING.** This company has purchased a.C.f. Valves since 1937.

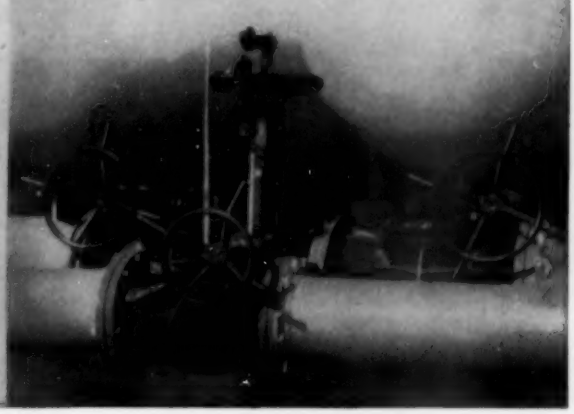


PROOF OF DEPENDABILITY

The knife-edge action of the a.C.f. Cylindrical Plug easily shears obstructions found in **SEWAGE TREATMENT PLANTS.** This action clears stoppages . . . allows for steady flow.



Because of their quick quarter-turn shut-off, a.C.f. Cylindrical Plug Valves are important in **NATURAL GAS INSTALLATIONS.** This allows immediate control of flow. Now **TEFLON* GASKETS** provide even greater dependability against head leakage. *TEFLON IS A DUPONT PRODUCT



acf

Representatives in 50 Principal Cities

CYLINDRICAL FULL PIPE AREA

PLUG VALVES

Write for descriptive Catalog 4-OG to ACF Industries Incorporated, Valve Division, 1501 E. Ferry Avenue, Detroit 11, Michigan.

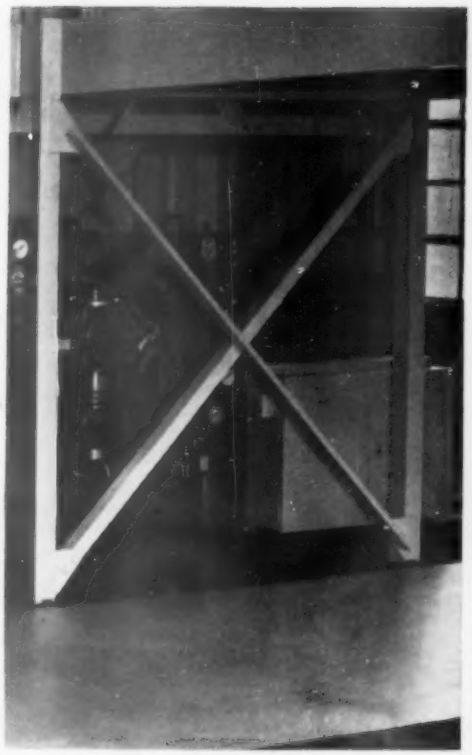
EXTRA POWER is available from G-E gas turbines. Performance records of gas turbines installed throughout the country show that the turbine is capable of 25 per cent more horsepower in cold weather—5700 hp is the rating at 80 F and it increases to 7100 hp at 40 F. Simple buildings can house the gas turbine . . . the building can be small in relation to the available horsepower.

G-E gas turbine's flexibility helps

CUSTOM-ENGINEERED low-voltage motor control is provided by G-E Cabinetrol*, made of standard enclosures and components assembled specifically for Seneca station.

*Reg. Trade-mark of General Electric Co.

INCREASING THE EFFICIENCY of the gas turbine is this regenerator (supporting stack), which "recaptures" the waste heat. This is economical even at low load factor.



OPERATION IS SIMPLIFIED with this convenient G-E control equipment. It includes a starting and supervisory control for the turbine, station valving and station pressures. Compact unit is factory-assembled.

Seneca station meet load changes

Atlantic Seaboard puts G-E gas turbine to work on pipeline having widely varying flow and pressure conditions

Changing weather and temperatures in Washington, D.C. make Atlantic Seaboard's Cobb-Rockville pipeline load vary widely. The task of moving the gas to meet the varying load demands is successfully met by Seneca's centrifugal compressor, driven by a General Electric 5000-hp combustion gas turbine.

It must start, stop, and adjust pressures and flow very often, but the versatile G-E gas turbine maintains desired conditions by adjusting its speed as necessary.

G-E engineers, working with Atlantic Seaboard engineers from the start, helped co-ordinate all the Seneca station's electric equipment with the gas turbine. Deliveries were carefully planned to dovetail with station construction schedules. Operators were briefed by G-E field service engineers before and during start-up.

A G-E gas turbine can pay big dividends in your pipeline operation, too. There are few moving parts, all rotating and easily accessible. It produces up to 25% more horsepower in cold weather when demand is greatest. It starts fast. Few men are required for this type of pipeline drive.

When you plan to increase your pipeline's throughput, inquire early about the specialized G-E engineering services offered through your nearest G-E Apparatus Sales representative. Write for bulletin GEA-5962 to Section 661-47, General Electric Company, Schenectady 5, N. Y.

Combustion Gas Turbines for the Gas Pipeline Industry—Backed by over 50 years of Turbine Leadership

GENERAL ELECTRIC

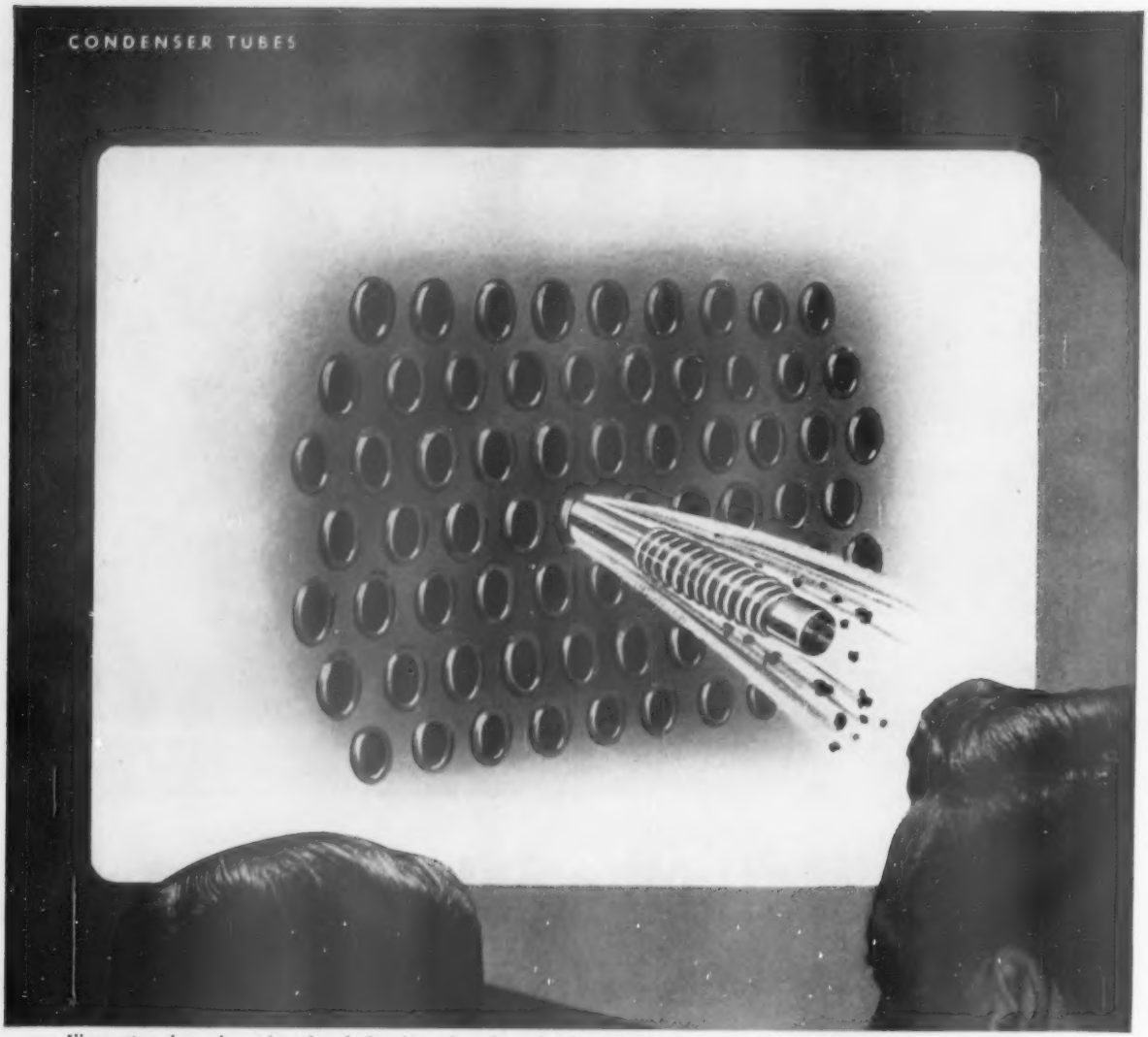


Illustration shows how short bristle brushes—shot through tubes by a high-pressure water stream—remove loose deposits.

COOLING WATER: how its composition affects life of condenser tubes

You can't always pick your plant site where water is noncorrosive. Economics may not permit it. If your plant is located inland, cooling waters generally will be relatively noncorrosive. Tide water plants, however, will have corrosion problems, particularly if the sea water is polluted with industrial or domestic wastes. This is especially true if the organic matter in the sewage is able to ferment under anaerobic conditions. Then sulfides are likely to form. In an enclosed harbor or in a dead-end channel, water may be more or less stagnant. There it is particularly subject to infestation by anaerobic bacteria.

Frequent cleaning of tubes will remove slimes containing bacteria. At the same time it will remove sulfide scales and increase tube life. You can also remove slimes by chlorinating polluted water frequently. This may aid in breaking down unwanted sulfide films on the inner walls of the condenser tubes.

In some cases you can dredge the channel bottom near the water intake to remove accumulations of decaying vegetable matter. This will help to maintain longer tube life.

Cooling water is only one factor affecting tube life. Publication B-2 "Anaconda Tubes and Plates for Condensers and Heat Exchangers," discusses *all* the important operational factors, and gives much other useful information. And, of course, our Technical Department stands ready to assist you in the selection of tube alloys from our extensive line. *The American Brass Company, Waterbury 20, Conn. In Canada: Anaconda American Brass Ltd., New Toronto, Ont.* 54104

ANACONDA®

Tubes and Plates for Condensers and Heat Exchangers

Arsenical Admiralty-439; Ambraloy-927; Cupro Nickel, 30%-702; and other copper alloys.*
*U. S. Patent No. 2,003,685 (Orig.)

Relamp or Convert to Higher Wattages in **SECONDS...**

with APPLETON vented Explosion-Proof Fixtures

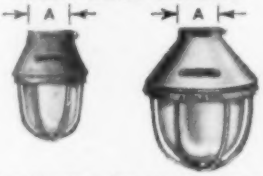
Patent Applied For

Standardized Unilet Body Permits 58 Second Interchange of 60 Watt to 500 Watt Fixtures . . . Saves Time, Prevents Shutdowns! *Appleton* AA-51 Series Vented Explosion-Proof Fixtures offer the most complete protection available today against spark-caused disaster . . . plus the shortest possible lamp exchange time regardless of individual lamp wattage, with no loss of man-hours and no lengthy machinery shutdowns.

The AA-51 Series meets all Underwriters' Laboratories requirements for Class I, Groups *C* and *D* Hazardous Locations.

More and more plants in the petroleum industry are standardizing on *Appleton* for maximum, efficient protection in hazardous areas. Full details are available. Write Today for Bulletin!

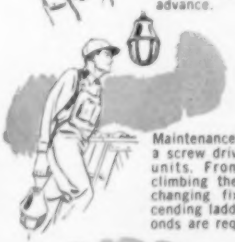
APPLETON INTERCHANGEABLE UNILET BODY FEATURE



Note how identical diameters "A" at top of Dome Unit Assembly permit mounting of all fixtures regardless of wattage.

58 SECOND RELAMPING

When the call comes for relamping, AA-51 Series STAND-BY Units are ready at an instant's notice. Carrying handles can be attached in advance.



Maintenance man needs only a screw driver to exchange units. From the time of climbing the ladder to exchanging fixture and descending ladder, only 58 seconds are required.

Burned out lamps and cleaning fixture are safely attended to at the work bench, while production schedules are maintained.

- **"FLAME-TIGHT" CONTACT CHAMBER**

  Because of *Appleton's* exclusive "5-Thread Safety Chamber" any AA-51 Series Unit can be serviced with complete safety even if current is inadvertently left on!

- **"FULL-CIRCLE" VENTING**

  The notched globe ring and the porous metal interior dissipate heat evenly and safely and keep fixture temperature cool enough to prevent igniting explosive gases.

- **"STAND-BY" SYSTEM SAVES MONEY**

  For every ten AA-51 Units in operation *Appleton* recommends one unit as a stand-by . . . ready for relamping or wattage conversion in 58 seconds.

SOLD THROUGH ELECTRICAL WHOLESALERS

APPLETON ELECTRIC COMPANY
1718 Wellington Avenue • Chicago 13, Illinois

Also Manufacturers of:

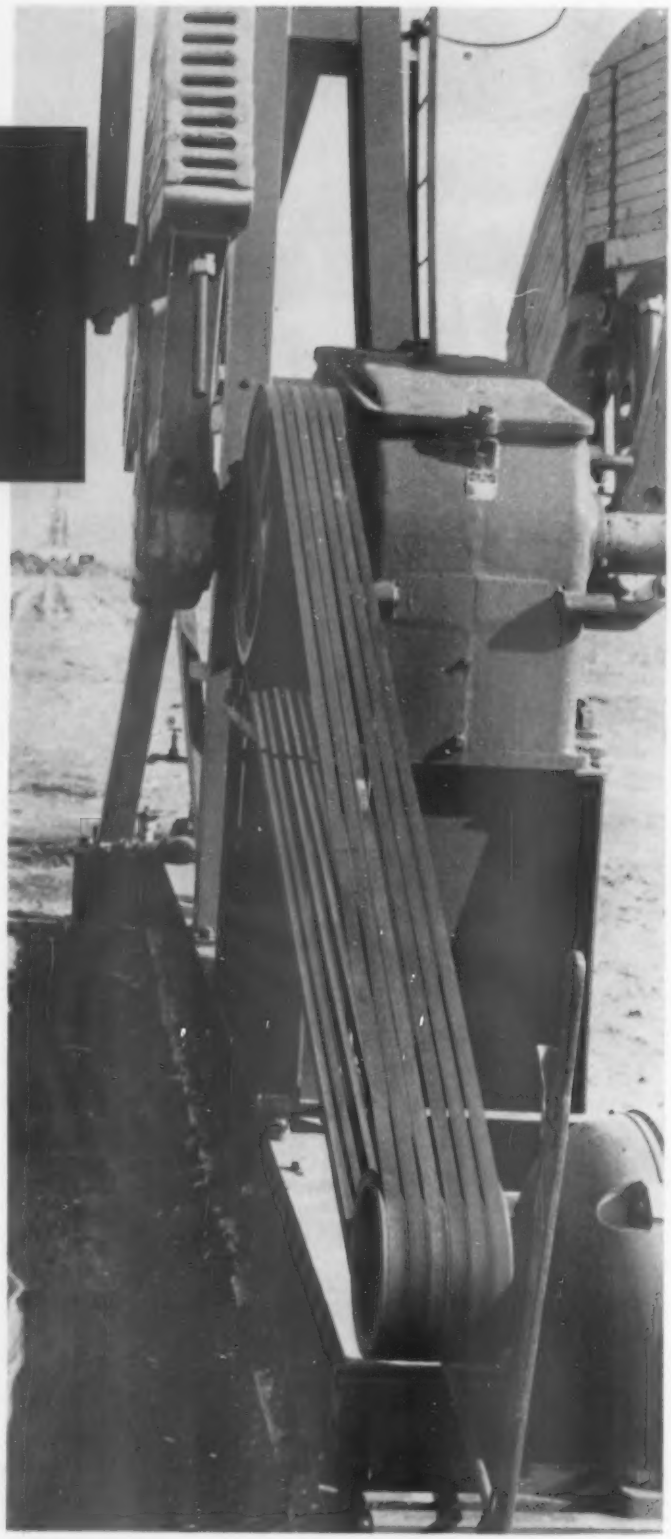
Malleable Iron Unilet Fittings

Industrial Lights

"ST" Series Connectors

Outlet Boxes

"Yes, It's IN STOCK"



● Those are wonderful words when you need a belt in a hurry. Yet, they are the rule rather than the exception when you call the Republic Oil Field Distributor in your field. He has a warehouse near you where he stocks **all** of your Republic Rubber Product needs.

Yes, whether you require V-Belts in individual sizes or matched sets, Rotary Drilling Hose, Vibrator Hose, Mud Pump Suction Hose, or any other Republic Rubber Oil Industry Product—call your local Republic Rubber Distributor. He has it in stock.

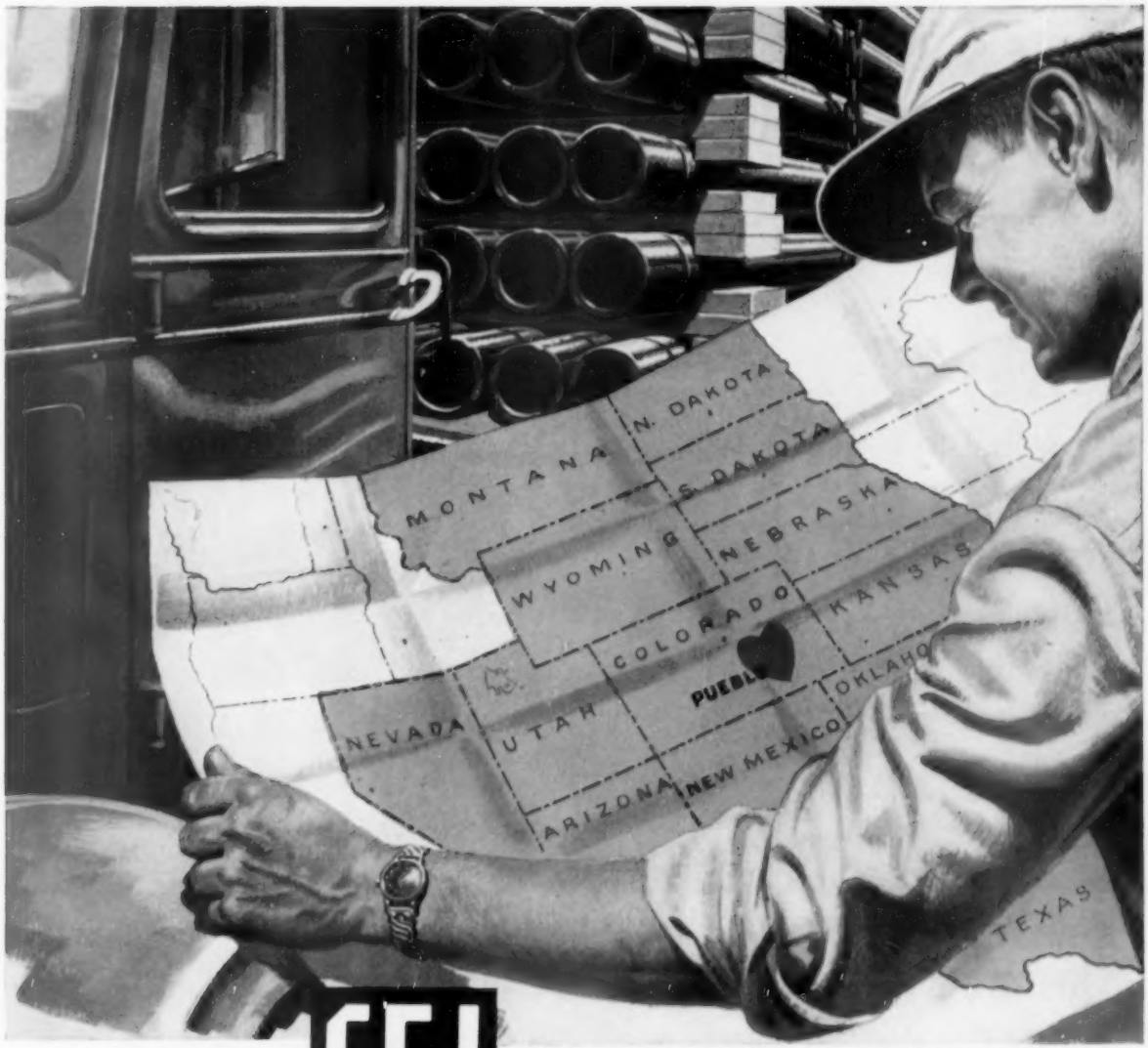
Stocked in the Mid-Continent Area by JONES & LAUGHLIN STEEL CORPORATION, Supply Division P.O. Drawer 2481, Tulsa 2, Okla. and the J & L Store in YOUR field.

REPUBLIC RUBBER DIVISION

LEE RUBBER & TIRE CORPORATION, YOUNGSTOWN 1, OHIO

INDUSTRIAL RUBBER PRODUCTS

Stocked on the West Coast by HENDRIE BELTING & RUBBER CO. 405 Towne Ave., Los Angeles, Calif. PACIFIC COAST RUBBER COMPANY 51 Main St., San Francisco, Calif.



THE NEW CF&I SEAMLESS TUBE MILL

set in the heartland of the oil country

Here at Pueblo, Colorado, stands the new C F & I Seamless Tube Mill — strategically located in the heartland of the Western oil country to give prompt on-the-spot attention to the needs of oil and gas companies in the Rocky Mountain and Southwest areas.

The new C F & I Seamless Tube Mill is the newest mill of its kind West of the Mississippi. To all members of the petroleum industry we extend a cordial invitation to inspect the modern facilities and advanced inspection techniques which now assure you of casing and tubing that are tops for precision and quality.

C F & I Seamless Oil Country Casing and Tubing meet API STD 5A specification and are available in sizes from 2⅜" O.D. through 9⅝" O.D.

2465

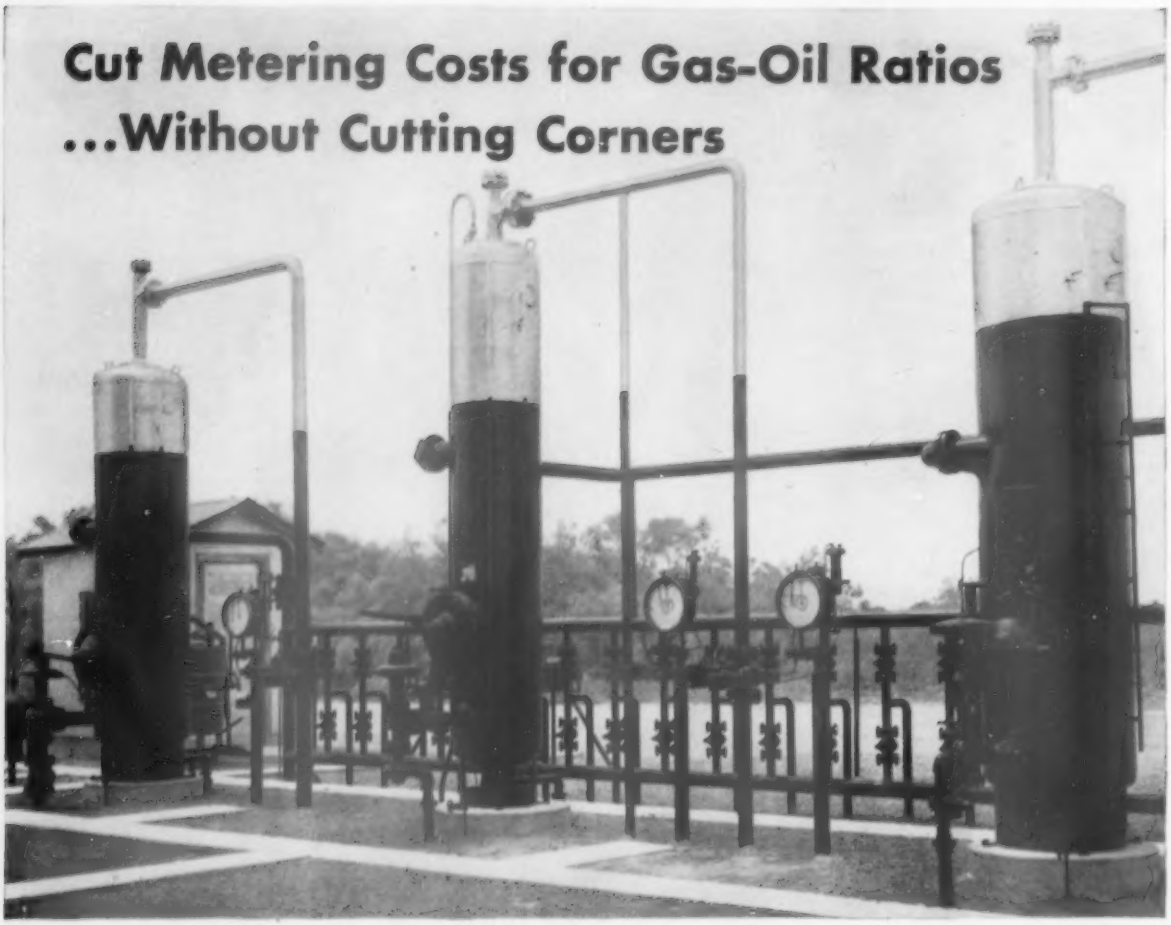
CF&I TUBULAR PRODUCTS

THE COLORADO FUEL AND IRON CORPORATION

DENVER, COLORADO

CF&I

Cut Metering Costs for Gas-Oil Ratios ...Without Cutting Corners



Measuring gas from Separator Batteries at Conoco Driscol Field, Benavides, Texas with 3 Foxboro Gas Flow Meters Type 4.

HERE'S THE WAY IT'S DONE

By taking advantage of the exclusive features built into Foxboro Flow Meters, you can cut meter inspection trips and recalibration to the bone . . . *and eliminate mercury losses completely.* You won't need to coddle these meters to get accurate records.

Foxboro Flow Meters are designed with *a unique straight-line linkage* that makes factory adjustments permanent. Their sustained accuracy is outstanding. Four to six years' service without recalibration isn't uncommon! In addition, floats of Foxboro Meters are *extra large* and have *extra long* travel. This means unequalled *power* . . . giving highest accuracy at the pen. *Sure-Seal Check Valves,* submerged in mercury, positively prevent mercury losses. And for freedom from friction and freeze-ups, Foxboro Pressur-Tite Bearings have never been equalled!

These are the reasons why experienced production men prefer Foxboro Flow Meters above all others . . . why you can cut metering costs without jeopardizing the accuracy of your records.

WRITE FOR Bulletin 460 for complete details.

The Foxboro Company, 608 Neponset Avenue, Foxboro, Mass., U.S.A.

FOXBORO REG. U.S. PAT. OFF. **MONEY-SAVING FLOW METERS**

THE J&L *PLUS* IN A. P. I. SEAMLESS CASING

J&L PIPE

A.P.I. Seamless Casing by J&L does more than meet the rigid requirements of the American Petroleum Institute.

Every step from mine thru finishing process is controlled by an organization that has made things of iron and steel for more than a hundred years.

JONES & LAUGHLIN SEAMLESS rolled in or stenciled on pipe rightly gives you confidence. It protects you against substitution. It is your assurance of plus values born of a century of progress on the part of the manufacturer.

J&L men throughout America are interested not only in the sale of pipe, but in the way it serves you.

J&L STEEL

Jones & Laughlin
STEEL CORPORATION
SUPPLY DIVISION —— TULSA
Serving The United States and Canada

The ANSWER to TOUGH TREATING PROBLEMS

SECo. INDIRECT EMULSION TREATERS

with NATIONAL BOILERS for steam generating efficiency

and NATIONAL HEAT TRANSFER SECTIONS for corrosion resistance

National Steam Generators have been developed over the years by The National Radiator Company, largest manufacturer of quality hot water and steam heating products in this country. These high efficiency boilers are available in a complete range of sizes—can be installed in multiples where necessary.

Heat Transfer elements in the gun barrel are built up from National Sections of close-grained, gray cast iron. The special design, externally and internally, increases the heat transfer rate and provides flexibility of capacity by the simple means of removing or adding to the sections. No hot spots, no scale formation means elimination of frequent clean-outs.

Seco Indirect Emulsion Treaters have been proved in actual field service as the ideal method for transferring heat in breaking crude oil emulsions. This effective assembly of National Boilers and Heat Transfer Sections is designed and installed by Stentz Equipment Company, Tulsa, Oklahoma. It is fully automatic and economical to operate and is available in a range of models to meet various capacity requirements or other special demands.

THE NATIONAL RADIATOR COMPANY

Heat Transfer Division

60 East 42nd Street • New York 17, N. Y.

Represented in Midcontinent and Southwest Oil Producing Areas by STENTZ EQUIPMENT COMPANY

P.O. Box 3367	P.O. Box 6445	P.O. Box 6125	3409 Oaklawn
Tulsa	Houston	Odessa	Dallas

NRC

Write for further information or for complete engineering consultation on your particular needs.

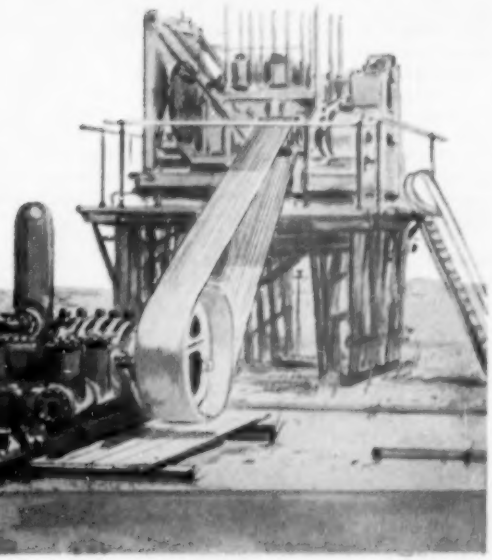
"I'm cost-conscious—that's why I use U. S. Rainbow V-Belts,"

says "Red" Royal

"My costs go up year after year, yet I'm under constant pressure to *cut* my drilling prices," says "Red" Royal. "To do this I have to drill more in less time by eliminating breakdowns. One way to avoid downtime is to use the best equipment and in V-Belts, it's U. S. Rainbow.® My crews give them quite a beating, location after location, and yet the belts never go haywire on me."

There's good reason why U. S. Rainbow V-Belts never cause downtime. They are designed and built by men who have spent a lifetime in the oil fields. They know exactly what drillers expect of U. S. Rainbow V-Belts. For extra power—for complete dependability—specify this *quality* "U. S." product—Rainbow V-Belts.

Developed by Science—
Proved by Drillers



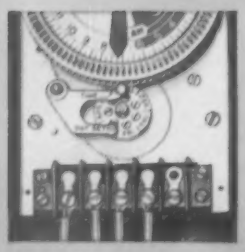
Available in all FIELDS at SUPPLY STORES

US RUBBER

UNITED STATES RUBBER COMPANY

MECHANICAL GOODS DIVISION · ROCKEFELLER CENTER, NEW YORK 20, N. Y.

Cutler-Hammer Program Time Switch gives automatically scheduled pumping, set up easily by means of pull tabs—one for each 15 minute interval.



Day-omission feature—for non-operation any selected days of week.

Cutler-Hammer 9589 Oil Well Pumping Controller with 3 coil overload protection and time delay relay.

ONE TRIAL WILL TELL YOU
It's Genuine
Oil Country
Control

You'll only have to make a comparison *once* to see why Cutler-Hammer Oil Well Pumping Control is called *the* Oil Country Control and to see why oil men are installing it in preference to any others.

It is the outcome of a genuine, thorough and sincere contact with oil country conditions; with oil men's wishes. Not just to start, stop and protect motors and equipment successfully and dependably . . . but to meet and beat the oil country enemies of good performance . . . heat, humidity, static, dirt, dust, bugs, prevalent single phasing, sometimes careless handling.

Take a look at C-H. Note the ventilating openings that create a chimney draft to keep the "works" cool. Note the aluminum coating that bounces back the sun's rays. Note the out-in-the-open contacts that stay cooler and being "vertical," shed dust.

Note how all openings are screened, baffled, louvred to keep out dirt and dust, and bugs. See how Neoprene gasketing keeps dust out of the timer how the excess torque clock motor keeps "ticking" away even if dust gets in.

Take a look at the scheduling mechanisms, the easy on-off scheduling in 15 minute increments, the automatic day-omission feature. And there's manual or automatic restarting after an outage, either all at once or staggered starting.

Here's a popular feature too . . . optional 3 coil overload protection where single phasing is a problem; standard 2 coil where it is not a problem.

Note you don't have to rebuild or clean up the starter after a lightning arrester blows.

These are but some of the features that make this starter stand out like a derrick on a flat plain. Once you try it, you'll keep on using it.

CUTLER-HAMMER, Inc., 1453 St. Paul Ave., Milwaukee 1, Wis. *Associate:* Canadian Cutler-Hammer, Ltd., Toronto, Ontario.

Snyder, Texas

Oilton, Okla.

Lamesa, Texas

CUTLER-HAMMER
MOTOR CONTROL
C-H

MEMBER AMERICAN PETROLEUM INSTITUTE

WHY IT PAYS TO BUY STAINLESS BARS FROM US

You needn't tie up money in costly inventory

TRIPLE SECURITY

What you want
When you want it
At the right price

• Most manufacturers find the cost of maintaining and handling large stocks of stainless steel is highly impractical. And it's certainly not necessary. For at any U. S. Steel Supply warehouse you always have the widest selection of types, grades and sizes of stainless—top quality, dependable USS Stainless Steel—within easy access.

Why not let *us* carry your inventory? Our larger stocks mean quick and easy procurement . . . and greater flexibility in design.

In addition, our experienced stainless men will gladly help you with your stainless design problems. They make certain that you always get the best grade for the job.

Next time you want the finest in stainless steel and in service, call the nearest U. S. Steel Supply warehouse. We carry USS Stainless Steel bars — rounds, squares, hexagons, flats, angles, channels — and USS Stainless sheets and strip.

U. S. STEEL SUPPLY
DIVISION

General Offices
208 So. La Salle St., Chicago 4, Ill.

USS

Warehouses and Sales Offices Coast to Coast

UNITED STATES STEEL

MAIL COUPON FOR FREE LITERATURE

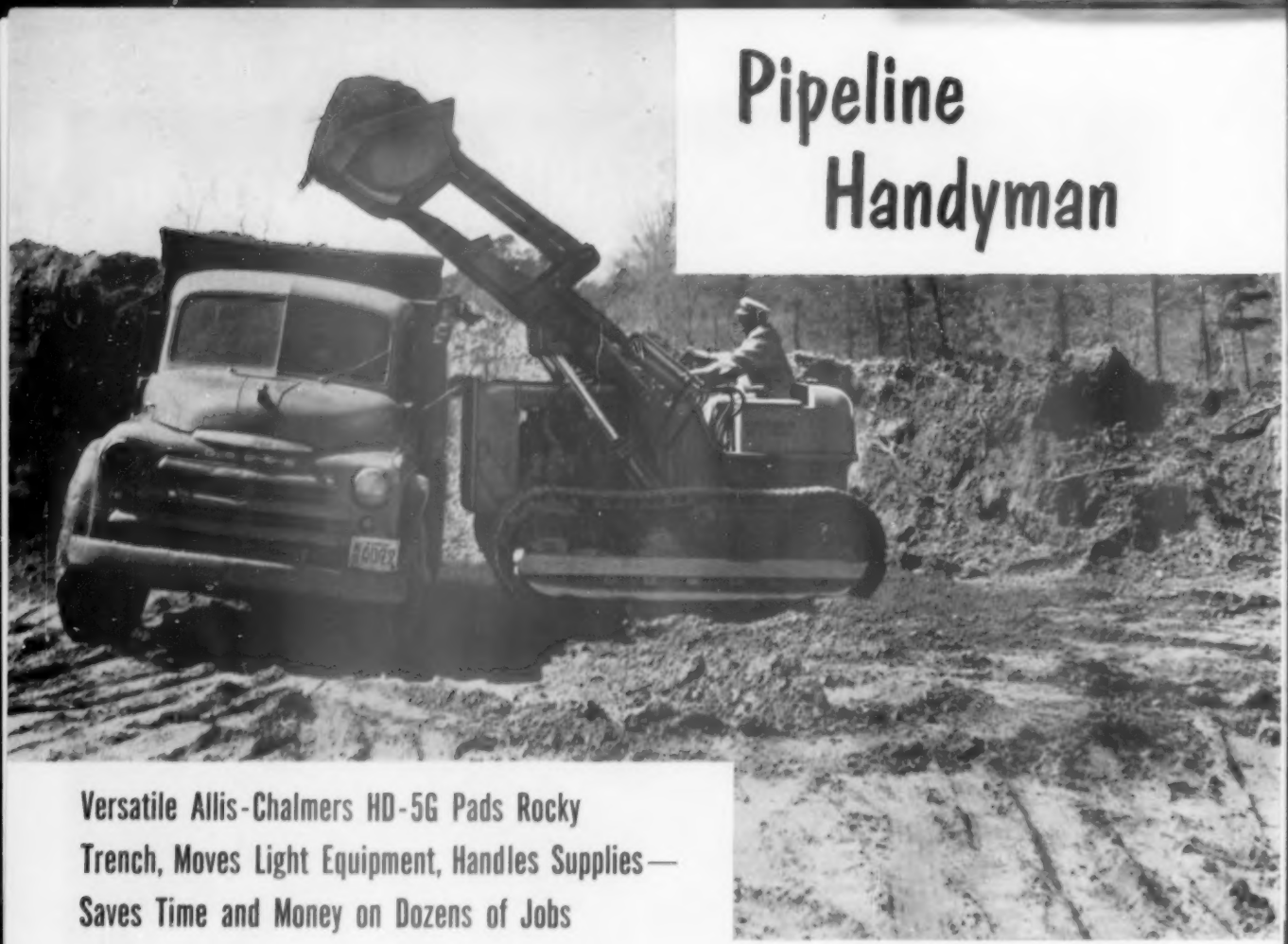
U. S. Steel Supply
208 So. La Salle St.
Chicago 4, Ill.

Gentlemen:

Please send me, without any obligation, your free literature on USS Stainless bars.

Name .....
Company .....
Address .....
City ..... State .....

Pipeline Handyman



Loads trench padding into trucks — dumping height of 9 ft, ½ in.

Versatile Allis-Chalmers HD-5G Pads Rocky Trench, Moves Light Equipment, Handles Supplies — Saves Time and Money on Dozens of Jobs

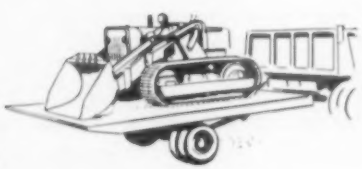
At work by the thousands in industry after industry, the Allis-Chalmers HD-5G 1-yd Tractor Shovel can be a real money saver for you on your pipeline spreads. With excellent balance and accurate control, this close quarters specialist quickly loads trench padding into trucks. For those jobs where suitable fill is nearby, the HD-5G digs, hauls and dumps the padding into trench — saves dollars by saving hours of hand labor.

Dumps padding into trench, quickly returns for another load.

Quick-Change Attachments Add to HD-5G Versatility

Bulldozer, angledozer, narrow bucket, rock bucket, crane hook, light materials bucket, trench hoe, lift fork, tine fork, rock fork are quickly interchangeable with standard bucket. Rear-mounted hydraulic ripper or winch adds to HD-5G's versatility. With these attachments it can handle skids, drums, valves — speed dozens of jobs in supply yard, around pump house or on the line.

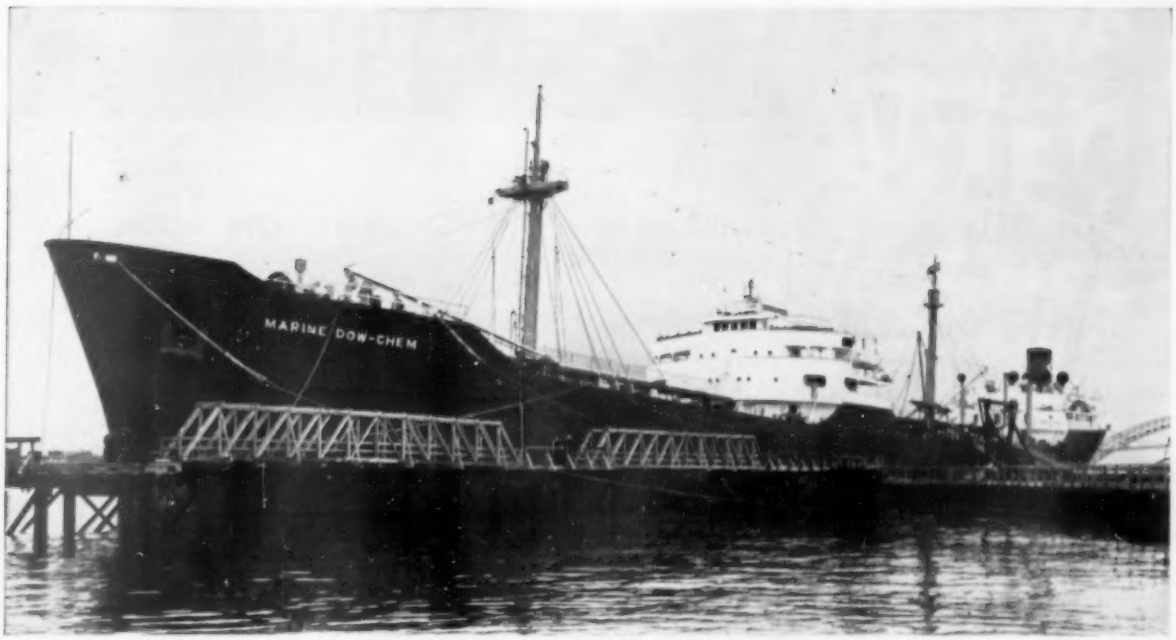
Allis-Chalmers Tractor Shovels are available in four sizes — 1, 2, 3, and 4-cubic yards. Your Allis-Chalmers dealer is eager to *prove* the outstanding versatility of this machine — with a demonstration *right on the line!* Set a date now or write for new descriptive literature.



For job-to-job moves, the HD-5G is easily transported by truck or trailer — only 6 ft, 6¾ in. wide.

• 50 belt hp • 16,200 lb including bucket

ALLIS-CHALMERS
TRACTOR DIVISION • MILWAUKEE 1, U. S. A.



S. S. Marine Dow-Chem on first arrival at expansive Bayonne Terminal.

New Dow Ship and New Dow Terminals
speed volume delivery of 73% caustic soda to users

The Dow Chemical Company now has extensive new caustic soda solution distribution facilities in operation. The *S. S. Marine Dow-Chem*, first tanker ever designed and built exclusively for the sea transportation of liquid chemicals, currently delivers 73% caustic soda in volume quantity to two new Atlantic seaboard bulk terminals, located at North Charleston, S. C. and Bayonne, N. J. Both this thoroughly modern 18,000-ton chemicals carrier and all terminal facilities for cargo unloading, storage and transshipment safeguard the uniform high purity of Dow's 73% caustic solution.

One hundred thousand pounds of commercially pure nickel were used in construction of the *Marine Dow-Chem*'s caustic cargo tanks, pumpline and heating coils. Terminal storage tanks are fully nickel-clad, all loading and unloading pumps and lines are pure nickel. Nickel steam heaters keep 73% solution at the exact temperature desired.

This important distribution expansion means that Dow customers are assured even faster delivery—*another* good reason for placing that caustic order with Dow. THE DOW CHEMICAL COMPANY, Midland, Michigan.

New flagship of extensive Dow waterways fleet begins maiden voyage from Freeport . . . new nickel-lined tanks at Bayonne protect 73% caustic purity during storage.

you can depend on DOW CHEMICALS

AVAILABLE JOHNSTON by AL CAPP
HELP!!
GRAMPAW JUST FELL IN THE WELL, BLESS HIS CREAKY OLD BONES!!
DON'T WORRY!!—HERE WE ARE—"AVAILABLE", AND "ACCURATE"—THE JOHNSTON BOYS—WITH OUR JOHNSTON JAR!!—
THEY KNOCKED GRAMPAW LOOSE!! NOW, THEY'RE FISHING HIM OUT WITH THAT JOHNSTON JAR!!
IT DOES BOTH JOBS!!
IT HIT WITH JUST THE RIGHT FORCE, TO LOOSEN HIM WITHOUT HURTING HIM!!—
THOSE JOHNSTON BOYS ARE AVAILABLE FOR ANY TESTING JOB—AND THEY DO IT SO ACCURATELY!
Al Capp

C-544

Copr. Capp Enterprises 1954

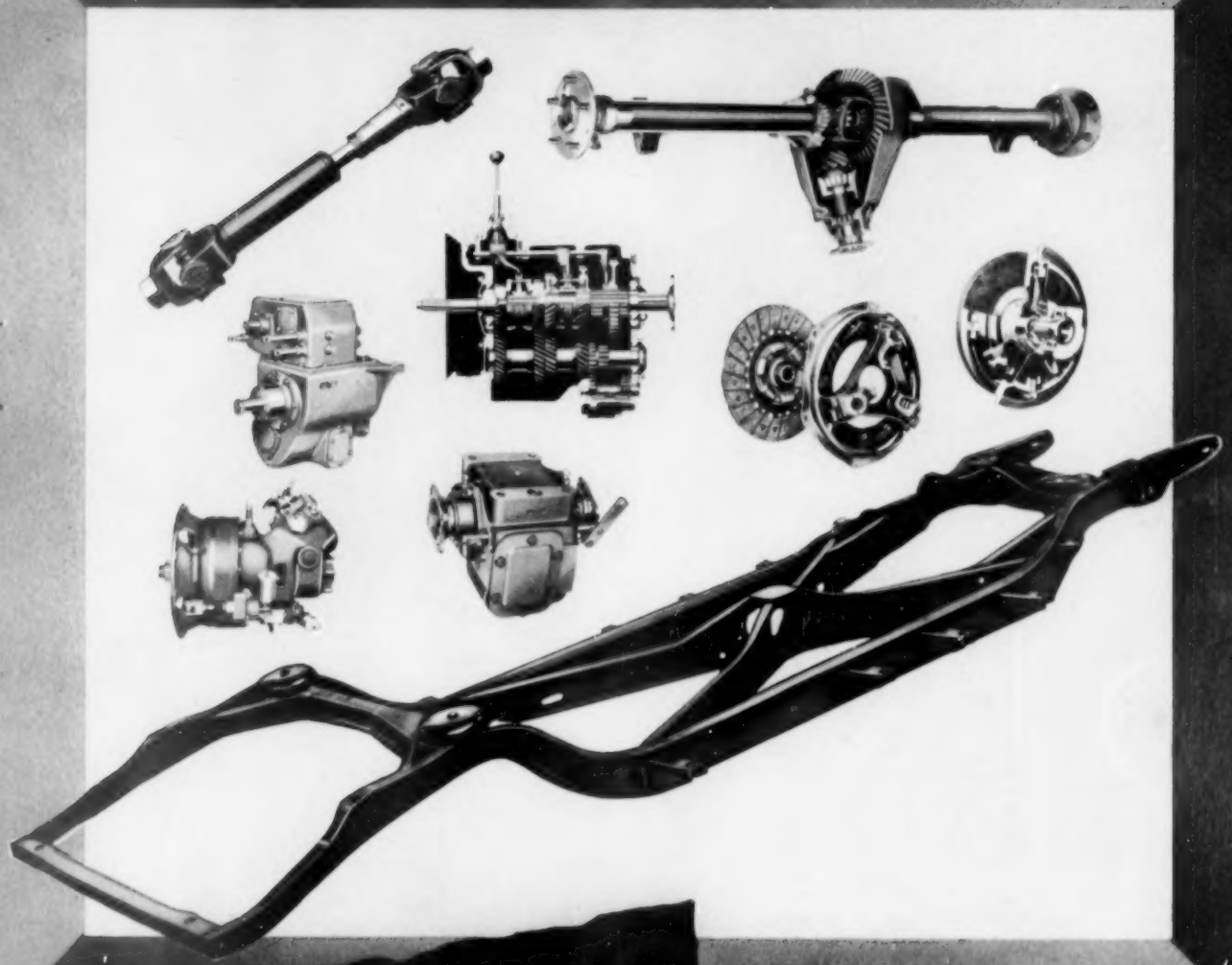
JOHNSTON TESTERS

first in drill stem testing

HOUSTON, TEXAS

LOS ANGELES, CALIF. • CALGARY, CAN.

FORMATION AND CASING TESTING — JOHNSTON



WE SUPPLY A WIDE VARIETY OF UNITS TO THE AUTOMOTIVE INDUSTRY

The Dana enterprises are widely diversified in their application to the modern automobile, truck, bus, tractor, and other types of vehicles.

This is the result of 50 years of steady growth and service to the industry. Since 1904, the world has seen many changes in automotive engineering. Dana has kept pace with these advancements, designing and developing many different functional units that are considered

"The Standard of the Industry"

Spicer

50 ANNIVERSARY 1904 1954

ENGINEERING

DANA

MANUFACTURING

THIS IS THE PARISH PRESSED STEEL COMPANY IN READING, PENNSYLVANIA

The extensive Parish plant serves the automotive industry with truck and passenger car frames; and also produces metal stampings used in many diversified industries.

PRODUCER OF QUALITY CHASSIS FRAMES

for Many Leading Manufacturers of Automotive Vehicles

Modern production equipment combined with manufacturing "know how" are prerequisites for supplying chassis frames to manufacturers of passenger cars and other automotive vehicles. Facilities at Parish Pressed Steel meet these requirements; and are also ideally suited to the production of a wide variety of pressed metal parts and assemblies.

Parish is a substantial supplier of frames for the Automobile, Truck, Bus and Trailer Industries, as well as a large number of other parts for the Automotive, Appliance, Railroad and general manufacturing industries.

PPS

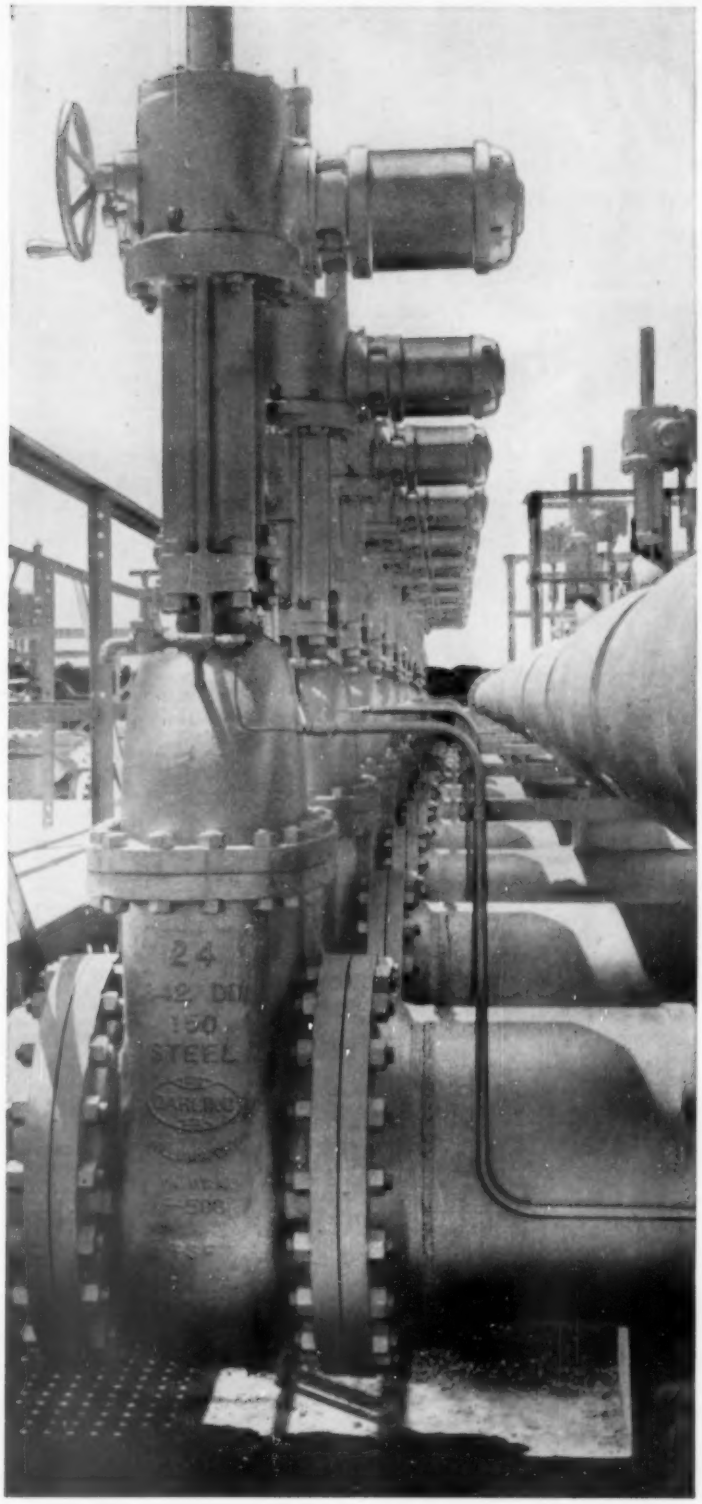
PARISH

Pressed Steel Company, Reading, Pa.

(A Wholly-Owned Subsidiary of Dana Corporation)

ENGINEERING **DANA** MANUFACTURING

TRANSMISSIONS • UNIVERSAL JOINTS • PROPELLER SHAFTS • BROWN-LIPE and AUBURN CLUTCHES • FORGINGS • AXLES • STAMPINGS • SPICER BROWN-LIPE GEAR BOXES • PARISH FRAMES • TORQUE CONVERTERS • POWER TAKE-OFFS • POWER TAKE-OFF JOINTS • RAIL CAR DRIVES • RAILWAY GENERATOR DRIVES • AIRCRAFT GEARS • WELDED TUBING



DARLING VALVES

How to line up a *cost-important* principle

THESE Darling gate valves have one thing in particular no other gate valves can match—Darling's *fully revolving double disc, parallel seat principle.*

What does this mean?

Skipping to end results . . . smoother, easier valve operation . . . automatic compensation for valve body distortion to assure tight closure . . . and avoidance of wear concentration areas on both discs. In turn all this just naturally adds up to longer valve life, surer performance, less maintenance, less part replacement, less down time, and lower over-all operating cost.

These gains are a matter of record—the real reason why Darling valves today are picked for so many oil and gas line jobs. Give us an idea of your service needs and get complete, specific details on the Darling valves that can do the *best* kind of a job for you!

◀ *Line-up of Darling 24" motor-operated steel gate valves at a major crude oil pumping station. Here, as elsewhere, Darling's fully revolving double disc feature pays off.*

DARLING VALVE & MANUFACTURING CO.

Williamsport 1, Pa.

Manufactured in Canada by Sandilands Valve Manufacturing Co., Ltd., Galt 19, Ontario

THE PROOF IS IN THE FIELD . . .

Carter

Long-stroke Hydraulic Pumping Units

Featuring the amazing Variable-Cycle Principle

Designed — Built — Priced FOR STRIPPER WELLS

CALIFORNIA

Carter Unit Pumping in Edna Field. Has been in service for seven years.

KANSAS

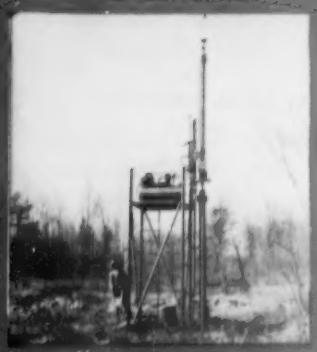
One of 4 units in the Great Bend Area, pumping from 3400 ft., owned by large independent.

EAST TEXAS

One of 8 Carter Units owned by a major oil company in Kilgore and Turnertown Areas. Pumping allowable from 3500 ft. Total cost about 60% of the cost of a conventional unit.

OKLAHOMA

One of seven units owned by an independent in the Tulsa Area, pumping from about 1900 ft. Operator reports production holding up better than offsetting wells with conventional units.



KENTUCKY

Carter Unit on 15-ft. substructure in the Green River Bottoms. Operator saved about 50% on substructure cost alone. This is one of seven units owned by this independent.

NORTH TEXAS

Major oil company installation in Caddo Field, pumping 30 bbl/day from 6250 ft. No rod failures in more than a year's operation. Total cost about 50% of the cost of a conventional unit.

CANADA

Carter Unit operating in 50 degree-below-zero weather in the Carbondale Field, showing adaptability of Carter Unit to extreme climatic conditions.

SOUTH TEXAS

Production increased from 3½ bbl/day to 6 bbl/day on this 2700-ft. well in the Duval County Area, when it replaced conventional equipment. This is one of 11 units owned by this independent.

WEST TEXAS

Carter Unit in the Spraberry Area, pumping from 7080 ft. This unit was installed for about 30% of the cost of a conventional unit.

MORE THAN 800 UNITS NOW IN SERVICE!
MORE THAN EIGHT YEARS OF FIELD EXPERIENCE!

From Canada to the Gulf, from Ohio to the Pacific, Carter Long-Stroke Hydraulic Pumping Units are saving thousands of dollars, for majors and independents alike, through lower first cost and maintenance as well as increasing production in many cases.

WRITE FOR BULLETIN PR-253

S. C. CARTER COMPANY, inc.
1900 Santa Fe Avenue • Los Angeles, California

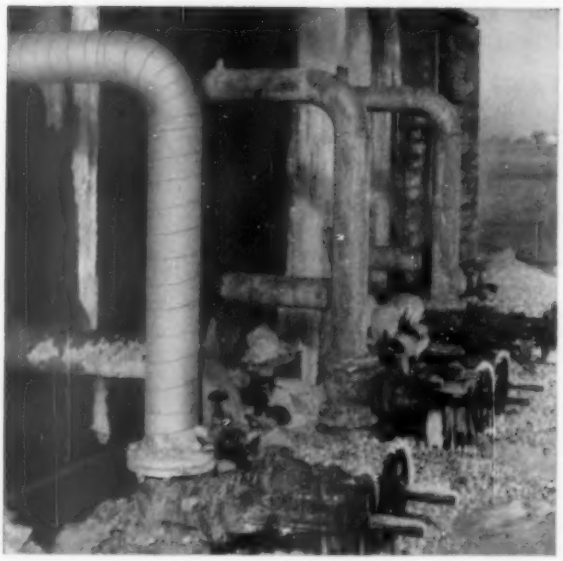
Sales and Service Representatives in—

CALIFORNIA — Los Angeles, ILLINOIS — Robinson, Salem, INDIANA — Princeton, Evansville, KANSAS — Chase, El Dorado, Great Bend, KENTUCKY — Irvine, Oil Springs, Owensboro, LOUISIANA — Harvey, Houma, Lake Charles, New Iberia, Shreveport, MICHIGAN — Mt. Pleasant, MONTANA — Conrad, Cut Bank, OHIO — Wooster, Zanesville, OKLAHOMA — Healdton, TEXAS — Alice, Barbers Hill, Bay City, Beaumont, Borger, Columbus, Corpus Christi, Houston, Kilgore, Liberty, Monahans, Pampa, Victoria, WEST VIRGINIA — Vienna, WYOMING — Casper.

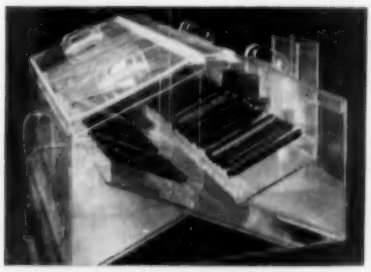
Export: Edmonton — Caracas — Maracaibo — Puerto La Cruz — Port of Spain

New corrosion protection

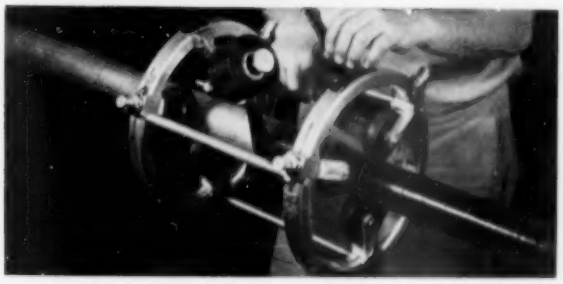
comes packaged from the factory



On Michigan-Wisconsin Pipe Line Co. cooling tower, where the temperature is freezing outside and 130° F. inside, the *Polyken* protected pipe on left has outlasted pipes on right 3 to 1 with still no sign of deterioration.



This specially designed spray chamber in the *Polyken* laboratories speeds up corrosion — shows in weeks how *Polyken* will withstand corrosion for years.



Quickly and economically applied. *Polyken* tapes are easily applied either by hand or portable tapester machine as shown here. Tapester wraps, splices, and laps uniformly, and quickly—up to 30 ft. per minute even by inexperienced men.

Controlled manufacture of POLYKEN plastic tape helps cut corrosion damage

Corrosion damage costs the U. S. billions, your company hundreds of thousands each year.

Tape—a new Polyethylene plastic tape made by *Polyken*—could be the big weapon in your fight against corrosion to save your company money.

Polyken Polyethylene tape—a tough plastic adhesive film—is manufactured in the factory under controlled conditions, not out on the job.

Its high resistance to galvanic, water and chemical corrosion never varies.

Its easy-to-handle tape form makes it simple and clean to apply. Requires no heat, liquids, solvents or thinners.

If you have a serious corrosion problem involving a curved surface, cylinder, pipe or tube, give *Polyken* a test.

Mail coupon for FREE samples and complete information.

Polyken®

PROTECTIVE COATINGS

POLYKEN PRODUCTS DEPARTMENT OF THE KENDALL COMPANY

Polyken, Dept. OG-H
222 West Adams St., Chicago 6, Illinois

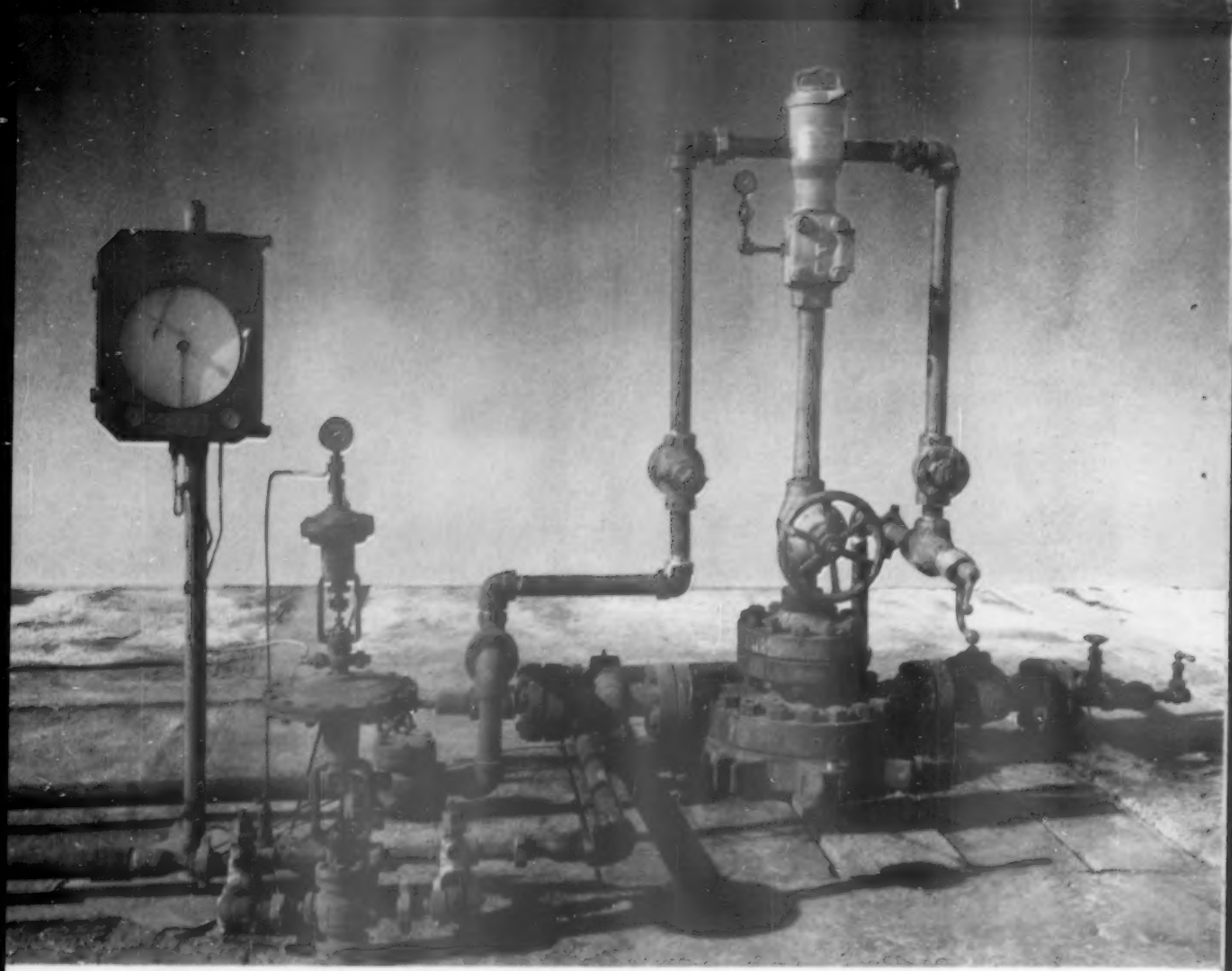
Please send me samples and further information on *POLYKEN* PROTECTIVE TAPE COATINGS.

Name_____ Title_____

Company_____

Street Address_____

City_____ Zone____ State_____



You can turn "problem wells" into profitable producers with the IDEAL® plunger lift

Simply designed, easy to install and economical to operate, the Ideal Plunger Lift uses either formation or injected gas to produce:

- Weak flowing wells in tight formations, regardless of depth
- Wells with high bottom-hole pressures and low productivity indices
- Wells with high gas-oil ratios

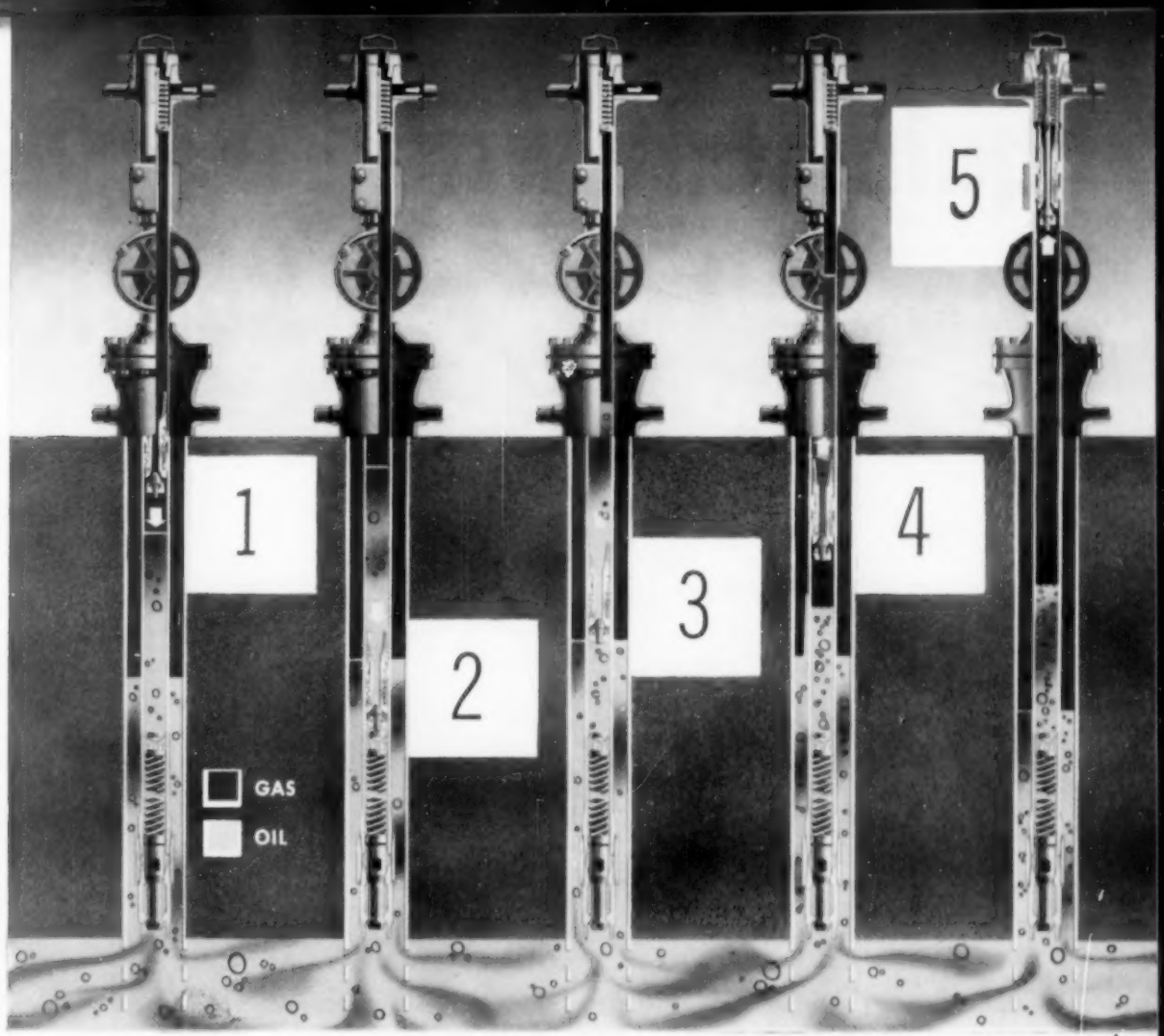
The Ideal Plunger Lift also helps to overcome costly and troublesome well conditions by:

- Preventing and removing paraffin deposits
- Preventing bottom-hole water accumulations
- Reducing emulsion to a minimum
- Reducing scale deposits

With no added gas, the Ideal Plunger Lift operates at lower pressures than required for natural flowing wells. With added gas, too, it maintains low injection pressures, thereby getting the greatest percentage of a well's theoretical production by gas-lift methods.

Along with low initial and service costs of the Ideal Plunger Lift, these economical operating features make it one of the most outstanding production units you can put to work.

You can get more information on the Ideal Plunger Lift at the nearby National Supply Store. A new descriptive bulletin which also contains facts and figures on Plunger Lift installations is yours for the asking. Why not stop in soon?



How the IDEAL® plunger lift works

1. The well is closed and the Plunger, with its valve open, falls by gravity to the well bottom (passing first through the gas in the upper portion of the tubing). Casing pressure is at low point of cycle.

2. With the well still closed, the Plunger strikes the footpiece which closes its valve. The Plunger is now a solid free piston, ready to lift the oil column above it to the surface. Casing pressure increases from low point.

3. When the casing pressure reaches high point, a valve at the surface automatically opens the well. Tubing pressure drops rapidly, and the Plunger starts ascent with load.

4. With the well open and casing pressure decreasing, the tubing pressure decreases to surface flow line pressure. The gas expands, propelling the Plunger with its load to the surface.

5. When gas and oil are displaced to the flow line system, the Plunger valve is automatically opened and the well is simultaneously closed. Casing pressure is at previous low point, and the Plunger again is free-falling, ready for another round-trip.

First in quality . . . First in supply service in oil country everywhere

THE NATIONAL SUPPLY COMPANY
PITTSBURGH 30, PENNSYLVANIA

NATIONAL BLUE PRODUCTS

DIVISION OFFICES: Denver; Ft. Worth; Houston; Pittsburgh; Tulsa; Torrance
CANADA: The National Supply Company, Ltd., 200 F. W. Clark Building, 709 Eighth Avenue, West, Calgary, Alberta
EXPORT: 600 Fifth Avenue, New York 20, N.Y., U.S.A.; River Plate House, 12 South Place, London E.C. 2

NATIONAL OIL FIELD MACHINERY AND EQUIPMENT • SPANG STEEL PIPE
SUPERIOR & ATLAS ENGINES

Equipment with Engineering Service

Send for Bulletin No. 405

WRITE OR PHONE US YOUR PROBLEM

MECO

MAINTENANCE Engineering CORPORATION

P. O. BOX 2637

3711 CLINTON DRIVE
HOUSTON, TEXAS

Speeding more gas to the nation

To HELP MEET the nation's growing demand for natural gas, hundreds of new gathering lines are being installed to feed the huge transmission lines.

To help keep these construction jobs on schedule, purchasers of line pipe are relying more and more on the prompt delivery of Basalt-Kaiser line pipe.

This dependable delivery—plus *uniform quality, wide range of sizes* and *experienced technical and metallurgical* service—is another reason why pipeline companies are careful to specify Kaiser Steel.

Kaiser Steel

KAISER STEEL PIPE SPECIFICATIONS • All pipe manufactured to latest A.S.T.M. and A.P.I. specifications

Type	Diameter	Length	Wall Thickness	Shipping Point
Continuous Weld—Threaded and Coupled	½" to 4" nominal I.D.	Uniform 21'	Standard	Fontana, Calif.
Continuous Weld—Plain End	2⅜" to 4½" O.D.	Up to 40'	Standard	Fontana, Calif.
Electric Resistance and Fusion Weld—Plain End	14" to 18" O.D.	Up to 40'	.250" to .500"	Napa, Calif.—Basalt-Kaiser
Electric Resistance Weld—Plain End	5⅝" to 12¾" O.D.	Up to 55'	.188" to .375"	Fontana, Calif.
Electric Fusion Weld—Expanded—Plain End	20" to 30" O.D.	Up to 40'	.250" to .500"	Napa, Calif.—Basalt-Kaiser

Prompt, dependable delivery at competitive prices • KAISER STEEL CORPORATION Los Angeles, Oakland, Seattle, Portland, Denver, Tulsa, New York

Premier's new 3000 barrel
UOP Fluid Catalytic Cracker

New Cat Cracker Placed in Operation By Premier

By R. P. Hargis, President
Premier Oil Refining Company of Texas
Longview, Texas

PREMIER Oil Refining Company of Texas recently completed a multi-million dollar expansion program at Fort Worth, Texas, making our refinery there one of the most modern in the entire Southwestern area.

R. P. Hargis

The expansion program was rounded out April 10 when a 3,000 B/SD UOP Fluid Catalytic Cracking unit of the latest design went on stream. It is designed to crack blended atmospheric and vacuum gas oils at a conversion rate of 74 per cent into gasoline having 92 clear research octane rating.

Installation of the cat cracker, with its attendant new polymerization and gas concentration facilities—all three of which were designed and licensed by Universal Oil Products Company—brings to six the number of major processing units in operation at the Fort Worth refinery. Others are a UOP Platforming unit, which has a design capacity of 1,500 B/SD, a thermal cracker, and a crude unit. With these facilities, the Fort Worth refinery has now become self-sustaining. Its supply of crude oil is piped from the Ranger Field into Fort Worth.

Four Reasons for New Unit

Four major factors motivated our thinking about installing a cat cracker less than three years after the company built the UOP Platforming unit. These factors were, in brief:

1. A cat cracker would enable Premier to make greater amounts of high quality finished gasolines; it would open up new avenues for marketing such products as butane-butylene; it would put Premier in the position of converting excess middle distillates into marketable products.

2. It would provide not only the Fort Worth refinery but Premier's other Texas refineries at Arp, Baird and Longview with a choice gasoline blending stock having an F-1 leaded octane number of 98 to 100.

3. It would further improve the refinery's economic position by making possible a larger gasoline yield from the crude run. The overall gasoline yield at the Fort Worth refinery was 52 per cent. It was estimated that with a cat cracker a gasoline yield of 67 per cent could be obtained—an estimate that since has proved to be accurate.

4. A cat cracker would permit operating the refinery at its crude oil capacity of 7,500 B/CD.

Coincident with the unit going on stream, Premier launched an intensive newspaper, radio and TV advertising campaign to introduce its new "Ignition Controlled" ethyl gasoline and "Dynamic" regular gasoline. We are now producing a 95 octane premium gasoline and an 86 regular motor fuel to meet the ever-increasing demands for higher quality gasolines in our trade territory.

We supply approximately 100 independent jobbers and more than 600 retail outlets in an area extending from Shreveport, La., on the east to Abilene, Texas, on the west, and from the Red River on the north to the central portion of Texas on the south.

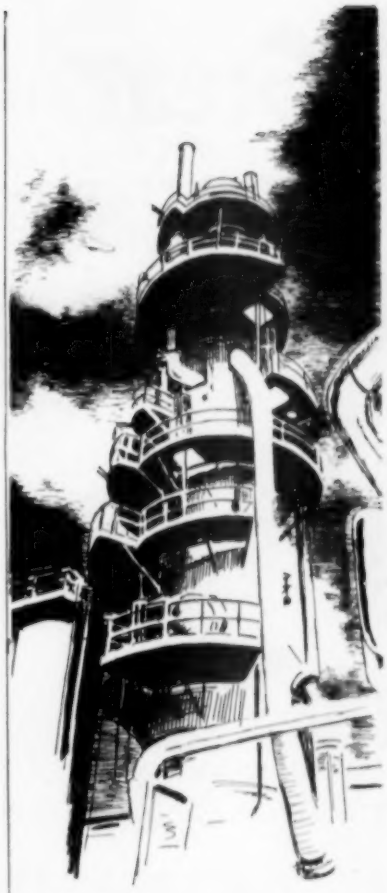
Octane Ratings Increased

Gasoline from the cat cracker is being transported to the Arp, Baird and Longview refineries for use as blending stock. This enables these plants to increase their octane ratings, and puts them in a more advantageous position to meet changing market conditions.

One of the unusual features of our new cat cracker is the placement of the reactor-regenerator on a structural steel skirt instead of having it mounted on a concrete base. Another interesting feature is the suspension of the air heater beneath the regenerator.

All of the pumps and the gas compressors are located under a reinforced concrete structure extending across the battery area parallel to the line of towers. Most of the heat exchangers, surge drums and receivers are placed on the roof of the concrete structure. This arrangement makes for compactness and maximum utilization of space, and enables our operators to control the unit with ease.

With the cat cracker now on stream, we are confident that the Fort Worth refinery is equipped to meet a wide variety of marketing conditions more profitably and with a greater degree of flexibility than was ever possible before.



PREMIER INCREASES GASOLINE YIELD WITH UOP FLUID CATALYTIC CRACKING UNIT

designed, engineered and licensed by

UNIVERSAL OIL PRODUCTS COMPANY

30 ALGONQUIN ROAD,
DES PLAINES, ILL., U. S. A.
Laboratories: RIVERSIDE, ILLINOIS

Universal Service Protects Your Investment

(Advertisement)

A Great OIL FIELD CHAIN

NOW BETTER THAN EVER!

PRECISION-BUILT REX OFFSET SIDE BAR ROLLER CHAIN

Rex Offset Side Bar Roller Chain, for years a favorite in the oil fields, is now better than ever. Improved materials plus the finest manufacturing techniques and heat treatment make it the ideal chain for high-speed, low-cost drilling. It is built to the same exacting tolerances and finishes as highest quality standard roller chain.

And you still get these outstanding Rex features . . .

- ★ It's built to take it . . . built-in clearances between working parts enable chain to operate under the toughest conditions.
- ★ Pins are heat-treated to resist shock loads. All parts are highly finished.
- ★ It's easy to couple and uncouple. Links exactly alike. No special coupler links to deal with. Can be lengthened or shortened by adding or removing only 1 pitch.
- ★ It comes boxed in convenient 10-foot lengths.
- ★ Runs over same sprockets as standard A.S.A. roller chain. Available from 1¼" to 2" pitch in single and multiple strands.

For all the details write for Oil Field Chain Bulletin No. 52-3. Chain Belt Company, 4619 W. Greenfield Ave., Milwaukee 1, Wis.

CHAIN BELT REX COMPANY ®

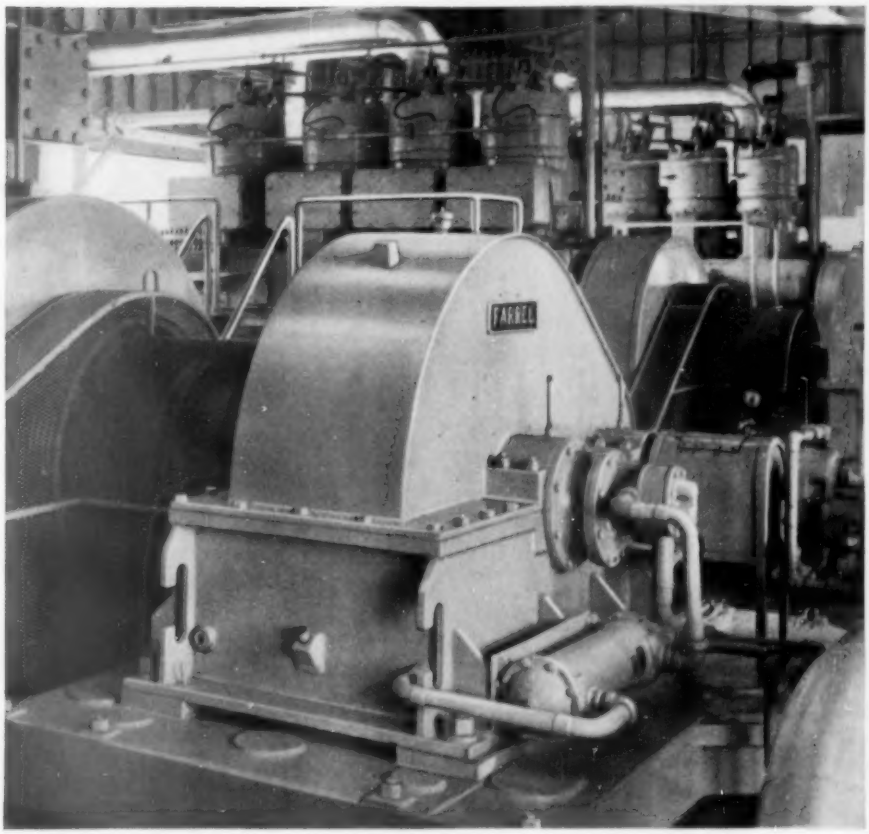
Chain Belt COMPANY OF MILWAUKEE

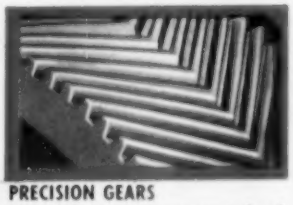
OIL FIELD SALES OFFICES

New York • Tulsa • Dallas • Houston • Midland • Los Angeles

"Sold in leading supply stores throughout the oil country."

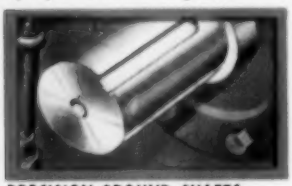
Farrel speed increasers give you smooth power transmission year after year . . . here's why



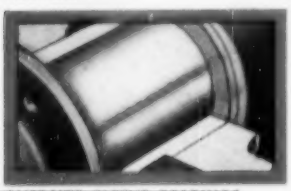


PRECISION GEARS
Herringbone gears generated with extreme precision by the Farrel-Sykes process.

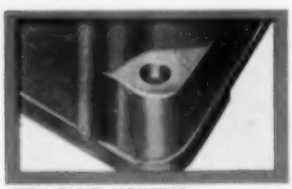
A "FOUNTAIN OF YOUTH"
Completely self-contained circulating system furnishes pressure lubrication to all bearings, and spray lubrication to gears.



PRECISION-GROUND SHAFTS
Extra large for the power to be transmitted. Give added stiffness against bending and torsional deflections.



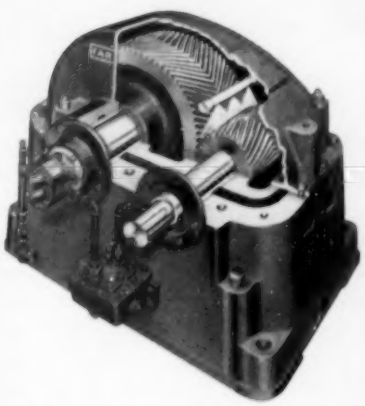
OVERSIZE SLEEVE BEARINGS
With consequent low unit pressures. Precision finished to extremely close tolerances.



VERY RIGID HOUSING
Holds rotating elements in original alignment, insuring maintenance of operating smoothness of gearing.

Since 1932, Farrel has worked closely with the oil industry to design speed increasers which will deliver power smoothly, year after year, meeting the unusual as well as the usual requirements of pipeline pumping service.

The standard line consists of 49 sizes with speed ratios ranging from 1:1 to 12:1. For higher ratios, double step-up units are supplied with ratio range from 12:1 to 40:1. For details of these proved-on-the-job speed increasers, send for a copy of bulletin 448A.



Farrel speed increasers in operation, including those originally furnished twenty-two years ago, now total over a quarter of a million horsepower.

FARREL-BIRMINGHAM COMPANY, INC.
ANSONIA, CONN.

Plants: Ansonia and Derby, Conn., Buffalo, N. Y.
Sales Offices: Ansonia, Buffalo, New York, Boston, Akron, Detroit, Chicago, Memphis, Minneapolis, Portland (Oregon), Los Angeles, Salt Lake City, New Orleans.

OIL FIELD REPRESENTATIVES:
Hercules-Lupfer Engine Sales Co., 124 N. Boston St., Tulsa 1, Oklahoma. V. W. Osborne, 860-A M & M Building, Houston 2, Texas

Farrel-Birmingham®

FB-924

ENGINEERING and CONSTRUCTION

by

PARSONS

Parsons regularly engineers and constructs complete units for atmospheric or vacuum distillation, catalytic cracking, catalytic reforming, fluid coking, alkylation, polymerization, desulfurization, lubricant manufacture, product storage and transmission, other process facilities and auxiliaries for the Petroleum Refining Industry.

THE RALPH M. PARSONS COMPANY

Engineers • Constructors

617 South Olive Street • Los Angeles 14, California

NEW YORK • TULSA • WASHINGTON • ANKARA • BAGHDAD • BEIRUT • KARACHI • PARIS

They Say—

Things to Change by Fall

"There has been some oversupply pressure on petroleum demands, particularly as to gasoline on the East Coast. The situation is considerably better on the West Coast than elsewhere . . . except for some accumulation of stocks on heavy oil out here.

". . . The present situation is only temporary in the long-range growth of the energy requirements of the nation.

"Various adjustments are taking place which may be expected to alleviate the short-range situation.

"Texas and Louisiana have again materially reduced allowables for August; some companies have cut back their refinery runs; a number have reduced imports. Added to these factors is the anticipation by oil economists that the percentage gains in gasoline and distillate consumption in the last half of the year, as compared with the like 1953 period, will be much larger than those experienced in the first half of 1954.

"We expect that the effect of these changes will be apparent by fall."

R. G. Follis, chairman of the board of Standard Oil Co. of California, in a quarterly statement to stockholders.

Texas and Her Tidelands

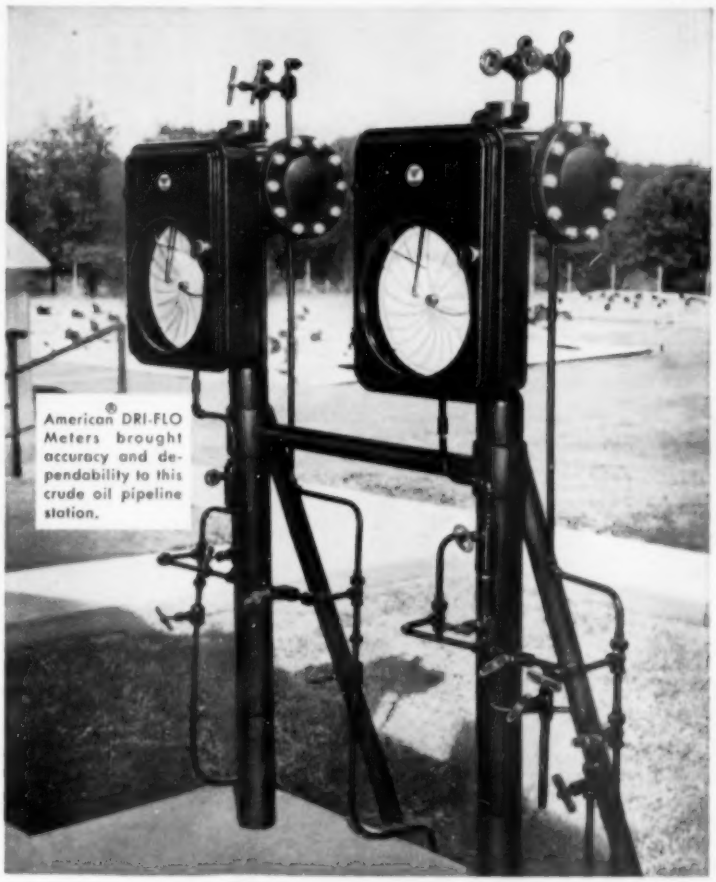
"Historically, in the case of Texas, this (a definition of the state's boundaries) means three marine leagues (10.35 miles) out in the Gulf, for that was the seaward boundary of the state when it was an independent republic and it was the boundary approved by Congress as part of the State Constitution when Texas entered the Union.

"Not only has this historic boundary been recognized by the federal Government from the time of Texas' annexation, but it has been insisted upon by the federal Government in numerous treaty negotiations with Mexico . . ."

Editorial in the Fort Worth Star-Telegram.

Sicily Still a Question

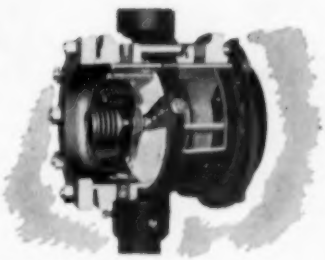
". . . Today we do not know with certainty whether Sicily will or will not prove to be rich with petroleum re-



Do you have a tough metering problem?

Installed at Mid-Continent Pipe Line Company's booster station at Seminole, Oklahoma, these two American DRI-FLO Meters measure high pressure (900 PSI) crude oil in the pipelines to the Company's Tulsa Refinery.

Meter accuracy and dependability are completely satisfactory despite constant vibration and the "tough" nature of the job. No seal pots are required, eliminating "blown" seals and emulsified mercury. Because of the close proximity (70 feet) to the discharge of the booster pumps, the meter pipestands are mounted in a concrete platform and are specially braced. Meter indications, read from the office window, help dispatchers quickly locate troubles such as line breaks, pump or valve failures—and eliminate running high pressure oil lines to the dispatchers office.



DRI-FLO Meters bring American-Westcott precision, simplicity of installation and maintenance, with maximum resistance to corrosive material, to applications where mercury manometers are not desired. Differential ranges: 20", 50", 100" and 200"; working pressures to 1000 PSI; Ambient temperatures of −25° to 175°F.

Write for full information

AMERICAN METER COMPANY

GENERAL SALES OFFICE: 1513 Race Street, Philadelphia
Albany • Alhambra • Atlanta • Baltimore • Birmingham
Boston • Chicago • Dallas • Denver • Erie • Houston
Kansas City • Los Angeles • Minneapolis • New York
Omaha • Pittsburgh • San Francisco • Seattle • Tulsa
IN CANADA: Canadian Meter Company, Limited, Hamilton
Edmonton • Calgary

OVER 1,000
UNIT INSTALLATIONS ARE:
Proven Insurance

INSURANCE
POLICY
$1,000,000

BURGESS-MANNING
Pulsation Snubbers

Stop Pulsation

Pulsation is dangerous and costly in any plant pumping gas. Designers and operators of hundreds of plants have called on Burgess-Manning Engineers to design gas pulsation snubbers to *STOP PULSATION* in their operation. Here's the record: Piping failure was eliminated. Gas flow improved for accurate measurement. Downtime eliminated. Less costly piping was installed. Smoother and more efficient equipment operation.

Stop gas pulsation in new plants or eliminate it in existing plants by calling on Burgess-Manning Engineers. Send for performance data today!

BURGESS-MANNING COMPANY

1203 DRAGON STREET
DALLAS, TEXAS

Sound Engineering

LIBERTYVILLE, ILL.
CHICAGO, ILL.

sources, and whether our hopes will remain merely a dream or become reality. However, it is clear that from the very beginning all measures must be taken in order to assure that this great wealth, if it exists, not remain underground.

"At this point, I should caution you not to hurry when you leave here to liquor stores to buy champagne bottles to toast to the thousands of billions that may spout out from under your feet in the near future because, if you really want that dream to be realized, as early as tomorrow morning you must arise, roll up your sleeves, and start working to get the oil or natural gas out from the ground. This requires a tremendous effort even in very wealthy areas . . ."

Cesare Carminiani, Rome petroleum engineer, in an address to the Catania and Ragusa Chambers of Commerce.

Politics in Supreme Court?

". . . In a degree, the decision (of the Supreme Court in the Phillips case) socializes Texas' gas resources for the benefit of the people in other parts of the country. The order of the Federal Power Commission freezing natural-gas prices makes this plain. This order is not the will of the FPC, which has actually taken an opposite stand. It seems merely to be carrying out the high court's order.

"The attempt of the court to deprive Texas of its tidelands oil in one instance, followed by the present decree which . . . fixes prices for the benefit of consumers in other states, makes it appear that a majority of the court have a political ear to the ground . . ."

Editorial in the Dallas Morning News.

Journal Helps Texas Archivist

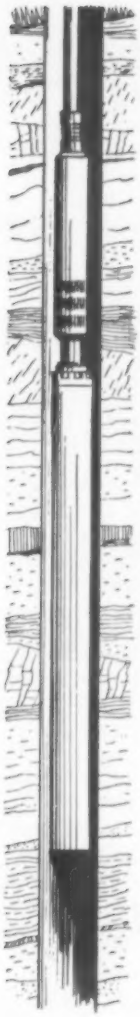
Dear Sir:

Recently we received in our office a letter from Winnie Allen, archivist at the Texas History Center, in which we were asked to furnish material concerning the marking of the first gas well in Texas.

We would appreciate receiving from your office two copies of The Oil and Gas Journal, July 12 publication, which ran on page 80 a picture of the unveiling at the dedication (of a monument at the site in North Texas of the state's first gas well).

Don R. Swick
Secretary-Manager
Henrietta and Clay County
Chamber of Commerce
Henrietta, Texas.

Editor's Note: They're on their way.



THE BEST WAY TO *LOWER* OPERATING COSTS.... *LOWER* A REDA PUMP INTO YOUR WELL

With continually rising labor and investment costs, economy of operation is of paramount importance in producing wells with decreasing oil-water ratios.

Reda pumps are given consideration as original or replacement equipment because of their known performance in producing fluid at a *lower* cost per barrel, thus often extending the ultimate economic life of wells.

Improved engineering and design have increased operating life. Increased operating life means *lower* labor cost per barrel, *lower* investment cost per barrel, *lower* maintenance cost per barrel: *lower cost per barrel produced.*

REDA
PUMP COMPANY
■
BARTLESVILLE, OKLAHOMA

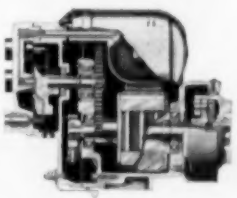
UNLIMITED RUNNING TIME FOR YOUR PUMPING ENGINES

When your pumping engines are equipped with Fairbanks-Morse Super Spark Magnetos be assured they are on the job making money for you day after day. These dependable magnetos are built to deliver efficient, economical and dependable service under the toughest operating conditions—cuts down-time—they rarely need attention or maintenance.

Standardize now on Fairbanks-Morse Super Spark Magnetos and cinch low cost trouble-free performance. See your Fairbanks-Morse service station or distributor or write Fairbanks, Morse & Co., Magneto Division, Beloit, Wisconsin.

ENGINEERED FOR TOUGH SERVICE

- **Compact, rugged, self-contained unit—few working parts**
- **Steady hot spark at all speeds**
- **Large, long lasting breaker points for quick starts—smooth performance**
- **Oversize high tension coils—built to take a beating**



- **Sturdy impulse coupling of simple design for easy starting**
- **Alnico Super Magnets cast into powerful one-piece magnetic rotor**

This is type FM-XOR six cylinder magneto with ball bearings throughout—available in base or flange mounting.

FAIRBANKS-MORSE
a name worth remembering when you want the best

MOTORS • ZC ENGINES • MAGNETOS • PUMPS • DIESELS

COMPLETE PROTECTION

EXCEL-SO SEPARATORS*

The only high-volume strainer that removes *water* as well as *dirt* from finished petroleum products.

CHECK INTERIOR CORROSION!

PROTECT PUMPS AND METERS!

Now available with quick-opening head and new EXCEL-SO REPACK CARTRIDGES

Write for complete information.

PHILLIPS PIPE LINE COMPANY uses EXCEL-SO separators ahead of desiccant dehydrators to remove free water and protect desiccant bed.

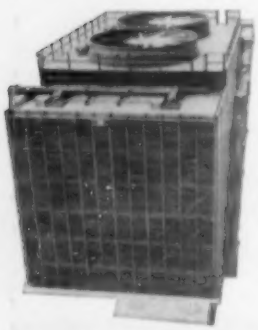
WARNER LEWIS COMPANY
DIVISION OF FRAM CORP. • BOX 3096 • TULSA, OKLAHOMA

If purchasing agents bought

PROCESS COOLING WATER...

Management would be even more keenly aware that water is worth saving. Cost-conscious P.A.'s would point out that water, like other raw materials, has a price — a very substantial price in any industry that requires process cooling, air conditioning or refrigeration. They would be keenly aware of the relationship between water cost and production profit.

Unless every drop of cooling water in your plant is doing its job 20 times over, the cost ratio is wrong, but correction is simple. Install a Marley cooling tower to recirculate and cool the water and you effect an immediate reduction of more than 95% in water consumption.



Every Marley cooling tower is the product of more than thirty years of specialized engineering research and development. With Marley, water cooling is science, not a sideline. That's why you should take your water conservation problems to a Marley application engineer. You will find these specialists in 52 major cities, eager to assist you without obligation.

Founder-Member
Cooling Tower Institute

The Marley Company
Kansas City, Missouri

MARLEY

Jersey Wants Freer Trade

"We think . . . that the best hope for a peaceful and prosperous world calls for a minimum of restrictions upon the flow of goods among nations. We feel that complicated customs procedures, discriminatory taxes and tariffs, quotas, systems of bilateral trading, restrictions on currency, and similar barriers to world trade cause more harm than good to the individual nations where they exist and to the larger trading spheres which they affect.

". . . Steps toward a more consistent foreign trade policy on the part of the United States would be of great benefit to many countries like France which depend on exports for part of their prosperity . . .

". . . No individual, no business organization, indeed, no nation can live by and for itself, serving its own interests alone. Our times are too complex for self-concern . . ."

Eugene Holman, chairman of the board of Standard Oil Co. (N. J.), in an address before The American Club, Paris, France.

CALENDAR

AUGUST

13 Southern Gas Association, pipeline operations and engineering conference, Rice Hotel, Houston.

16-17 North Dakota Oil and Gas Association, second annual convention, Bismarck, N. D.

16-18 Society of Automotive Engineers, West Coast annual meeting, Statler Hotel, Los Angeles.

20 Southern Gas Association, conferences on natural-gas gathering and natural-gas processing, Captain Shreve Hotel, Shreveport.

20-21 Southern Gas Association, natural-gas processing and pipeline operations conference, Herring Hotel, Amarillo, Texas

23-25 Appalachian Gas Measurement Short Course, West Virginia University, Morgantown, W. Va.

26-28 (tentative) Intermountain Association of Petroleum Geologists, fifth annual field conference, beginning at Price, Utah.

27-28 Joint meeting, reserves committees of A.G.A., A.P.I., Canadian Petroleum Association, Banff, Canada.

SEPTEMBER

6-11 American Chemical Society, national meeting, Conrad Hilton Hotel, Chicago

7-9 Association of Desk and Derrick Clubs of North America, annual convention, Banff Springs Hotel, Banff, Alta.

8-10 Pacific Coast Gas Association, sixty-

REFINERY PROCESS NEWS

PUBLISHED BY REFINERY PROCESS DIVISION, THE M. W. KELLOGG COMPANY AUG.-SEPT. 1954

Combination Processing Effects Big Savings in Direct Operating Costs

While first investment costs are probably as closely scrutinized as any other figures in planning a new oil refinery, the combination design offers several additional advantages over conventional unit-by-unit processing. One of the most important is found in direct operating costs. Substantial savings are possible in such items as labor, fuel, power, steam, water, and maintenance.

Although there are savings in maintenance charges and utilities —particularly through the conservation of heat due to the virtual elimination of intermediate storage —the largest reduction in direct operating costs for combination units is derived from smaller labor requirements.

Labor Requirements Reduced by More Than 20 Per Cent

Total operating personnel needs may be slashed by about 30% while total refinery personnel which includes clerical, maintenance and supervisory staffs, may be cut more than 20%.

For example, a 10,000 BPD conventional plant requires an estimated payroll of 90 operating men in comparison with 63 for a combination refinery. As far as total personnel are concerned, the comparison shows 206 versus 157. Studies of 20,000 BPD and 40,000 BPD capacity installations indicate similar low labor requirements for combination plants.

In addition to the savings already mentioned, combination refining has a further advantage in improving yields by reducing evaporation and other losses. About a 1% increase in gasoline yield can be expected in a 10,000 BPD combination unit, or about 4,200 gallons daily.

Together with savings in first costs, operating savings can increase the percentage return on a combination refinery up to one and one-half to two times that of a plant comprising individual units.

20 to 25% Investment Savings Spur Use of Combination Processing

A total of six combination refinery projects underway by Kellogg —all but one of them completely new refineries—spotlight the fact that the combination processing principle is an important answer to the petroleum industry's increasingly competitive market picture. More than sufficient incentive for the trend has been the possibility of slashing as much as 25% from the total cost of a new refinery by combining the various process steps into a single, centrally controlled operation.

Combination processing is, of course, not a new idea. A fundamental chemical engineering technique, it was first applied to refining in the early thirties when Kellogg engineered several prototypes of modern integrated plants. After World War II, the present trend began in earnest once stable competitive conditions returned to the market and processing economics again became primary considerations.

The postwar building program saw numerous combination thermal cracking refineries in South America, Europe and the Middle East. In the U. S. and Canada, the trend has continued with new combination refineries as well as expansion and modernization programs in which existing units have been integrated with new facilities. And in many programs, the original concept was extended to catalytic processes including cracking, alkylation, polymerization, and reforming.

Major Savings Achieved in Two Principal Areas

In designing a plant as a combination operation (as opposed to the conventional design wherein a series of individual, independently controlled process units are each complete with intermediate storage) investment costs are cut in two important categories. Perhaps the most obvious is in the elimination of intermediate storage and other off-site facilities. Economic studies, later proved by experience, have shown that for a combination plant, cost of off-site facilities can be reduced as much as 40%.

Other savings stem from economies in process equipment. By skillful integration, the same fur-

(Continued on reverse side)

REFINERY PROCESS NEWS

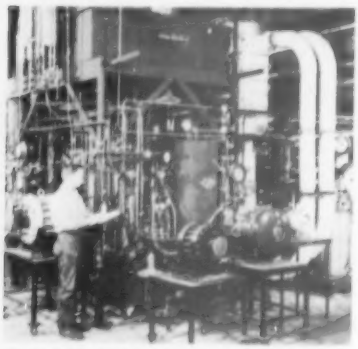
CONTINUED FROM PRECEDING PAGE

(Continued from previous page)

20 to 25% Savings . . .

naces can be made to serve more than one purpose; towers can be made to handle streams from more than one operation; the number of pumps can be radically reduced since intermediate products are not stored between processing steps; and, for the same reason, heat is retained in the stream from one process step to the next so that the number of heat exchangers is reduced throughout the refinery. Final savings in process equipment alone can be anywhere from 5% to 15%.

The overall effect of these savings adds up to the possibility of erecting a complete new refinery—in combination—for around 20% to 25% less than the cost of building comparable equipment incorporating separate process units.



KELLOGG PILOTS SUPPLY DESIGN DATA
. . . this unit is utilized to study the combination operation of a catalytic reformer with a desulfurization plant.

For further information, technical data, etc., on any refining process, write

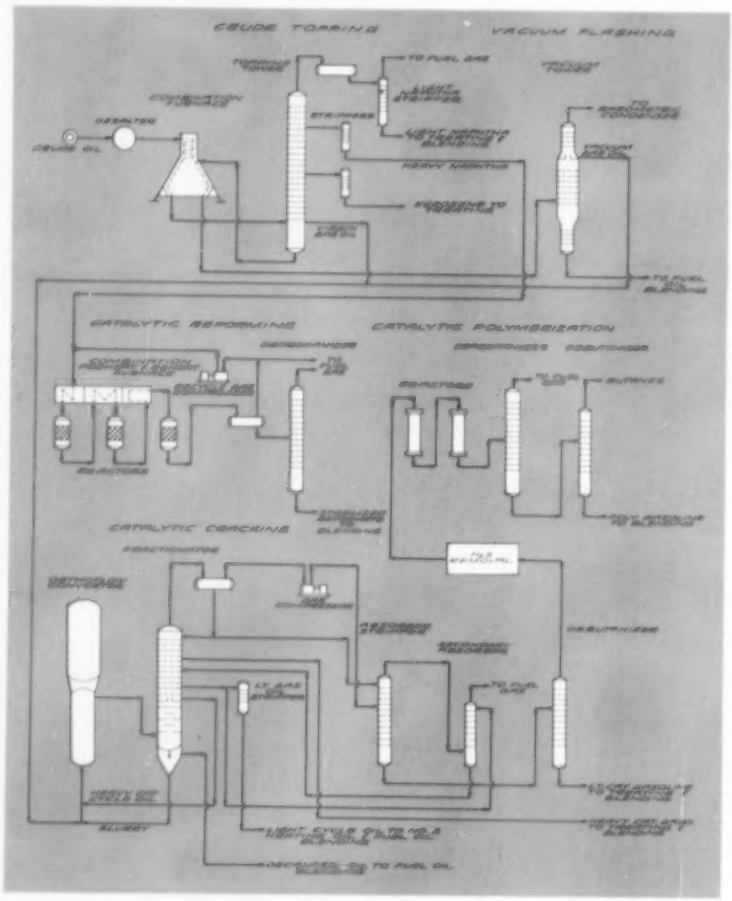
REFINERY PROCESS DIVISION

THE M. W. KELLOGG COMPANY

225 Broadway, New York 7, N. Y.

Also Jersey City,
Los Angeles, Tulsa, Houston, Toronto, London and Paris

M. W. KELLOGG — DIVISION OF PULLMAN INCORPORATED



Flow Chart Highlights Savings . . .

The variety of processing sequences that may be operated in combination is limited only by the number of processes available or desired. The accompanying simplified flow sheet shows one type of combination refinery. It includes topping, catalytic reforming, vacuum flashing, Orthoflow fluid catalytic cracking, gas recovery and catalytic polymerization. The flow of oil is clearly indicated.

As can be noted, combination has effected a number of economies in investment costs. One furnace handles the heating requirements of the topping unit and vacuum flasher instead of the conventional two. A combination furnace is also employed in the reforming step.

Further savings are obtained in the cat cracking step. No charge furnace is required because the gas oil from both the topper and vacuum flasher is at a high enough temperature to be fed directly to the unit.

These are some of the more obvious investment savings reflected in the flow chart. Others include elimination of intermediate storage, reduction in heat transfer equipment, lower pumping requirements, and elimination of control room duplication.

In some types of combination plants, one tower may serve the fractionating requirements of two or three different processes. Another instance of a unique processing advantage is that one process can be made to eliminate a component which has a deleterious effect on a subsequent process: e.g., combination catalytic polymerization and alkylation wherein the cat poly process reduces the amount of butene-1 in the C_4 cut, a component which otherwise lowers the octane of the alkylate product, although it is the best butene for polymerization. These are but a few of the many advantages which can accrue from combination design.

first annual meeting, Vancouver Hotel, Vancouver, B. C.

9-11 Billings Geological Society, annual field conference, Billings, Mont.

9-11 Interstate Oil Compact Commission Omaha, Neb.

10 Southern Gas Association, conference on compressor-station operation, Jung Hotel, New Orleans.

12-16 American Institute of Chemical Engineers, Colorado Hotel, Glenwood Springs, Colo.

13-14 Independent Natural Gas Association of America, annual meeting, Roosevelt Hotel, New Orleans.

15-16 American Gas Association, sixth annual accident-prevention conference, Bond Hotel, Hartford, Conn.

15-17 American Petroleum Institute, lubrication committee, Traymore Hotel, Atlantic City, N. J.

15-17 National Petroleum Association, fifty-second annual meeting, Traymore Hotel, Atlantic City, N. J.

16-17 Mid-Continent Oil and Gas Association, Louisiana-Arkansas division, annual meeting, Roosevelt Hotel, New Orleans.

17 Natural Gasoline Association of America, Oklahoma regional meeting, Skirvin Hotel, Oklahoma City.

23-24 Western Petroleum Refiners Association, regional meeting, Henning Hotel, Casper, Wyo.

27-28 Symposium on Methods for Testing Liquefied Petroleum Gases (ASTM D-2; ASTM D-3, CNGA & NGAA), Statler Hotel, St. Louis.

27-29 Electrical Conference for Petroleum Industry, American Institute of Electrical Engineers, Mayo Hotel, Tulsa

27-30 Ninth Annual Petroleum Mechanical Engineering Conference, petroleum division of the American Society of Mechanical Engineers, Statler Hotel, Los Angeles.

28-29 Texas Mid-Continent Oil and Gas Association, Baker Hotel, Dallas, Tex.

30 Southern Gas Assoication, conference on transmission management, Shamrock Hotel, Houston.

OCTOBER

1 Southern Gas Association, conference on gas pipeline rights-of-way, Rice Hotel, Houston.

1-2 Standards Engineers Society, annual meeting, Haddon Hall, Atlantic City, N. J.

3-7 ASTM Committee D-2 on Petroleum Products and Lubricants, Sheraton Park Hotel, Washington, D. C.

4-6 Texas Mid-Continent Oil and Gas Association, annual meeting, Plaza Hotel, San Antonio, Tex.

4-6 Petroleum Electric Power Association, twenty-sixth anniversary meeting, Jung Hotel, New Orleans.

5-7 American Institute of Electrical Engineers, Middle Eastern district, Abraham Lincoln Hotel, Reading, Pa.

6-8 Eighteenth Technical Conference on Petroleum Production, Pennsylvania State University, State College, Pa.

7-8 California Natural Gasoline Association, twenty-ninth annual fall meeting Ambassador Hotel, Los Angeles.

7-8 American Institute of Mining and Metallurgical Engineers, Pacific Petroleum chapter, fall meeting, Biltmore Hotel, Los Angeles.

10-13 American Association of Oilwell Drilling Contractors, fourteenth annual meeting, Biltmore Hotel, Los Angeles.

10-16 Oil Progress Week.

11-13 American Gas Association, annual convention, Atlantic City, N. J.

Try this pair of nylons for longer, more comfortable service!

WILLSON®

Kover-Mor goggles

Strong...Light...Comfortable

For Welders ▸

Willson *Spatterproof*® cover glass protects *Willson-Weld*® filter glass against pitting. (*Note* four indirect ventilating ports admit ample air but keep out sparks and flashes)

Style CW-70

Style CC-70

◂ For Chippers

Willson *Super-Tough*® lenses are heat-treated for impact resistance. (*Note* four screened eye cup ports admit air to keep lenses fog-free)

Kover-Mor Welding and Chipping Goggles fit easily over larger-frame prescription glasses—use standard 50 mm. round lenses—offer these other new Willson developments:

1. Lightweight nylon offers *highest strength/weight ratio* known for goggle cups; non-flammable; won't conduct heat

2. External screw caps permit *easier lens* changing—no springs or clamps to remove

3. Standard 50 mm. round lenses make it unnecessary to stock odd-size replacement lenses

4. Extra ventilation is provided by slots in screw caps plus ports in cups

5. *Rigid metal top bar* makes Kover-Mor Goggles easier to handle; keeps them firmly in place

Ask your Willson distributor for new Kover-Mor® Welding or Chipping Goggles — strongest lightweight goggles you can get — or write for new bulletin.

Easy to get anywhere!

®Trademark

More Than 300 Safety Products Carry This Famous Trademark

WILLSON®

Established 1870

WILLSON PRODUCTS, INC., 204 Washington St., Reading, Penna.

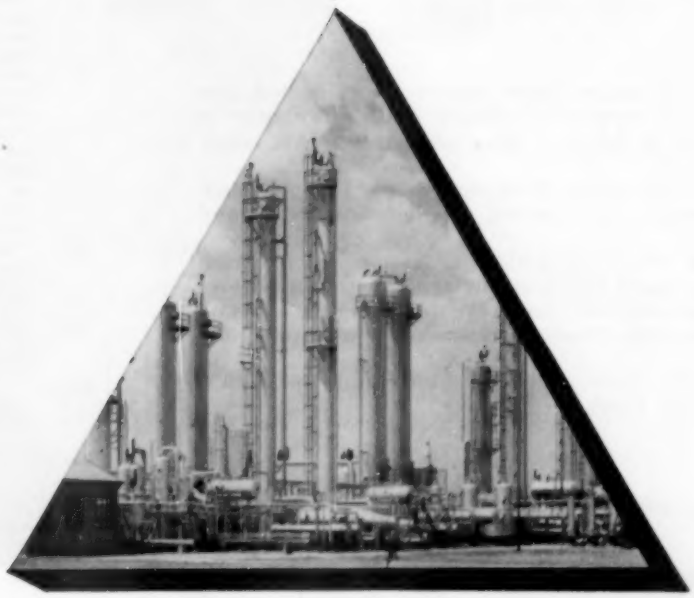
Serving ... **WORLD-WIDE** ...

THE CONTINENTAL SUPPLY COMPANY, *General Offices:* DALLAS, TEXAS

Continental representatives are constantly aware of the Field Processing industry's many needs and how best to meet them. The services of these men in the field are augmented by a staff of experienced engineers familiar with Field Processing construction and operation . . . men who take a practical approach in studying customer requirements.

This service — on a world-wide basis — supports the distribution of equipment and supplies unsurpassed in quality . . . through Continental's strategically located stores and offices.

. . .THE FIELD PROCESSING INDUSTRY

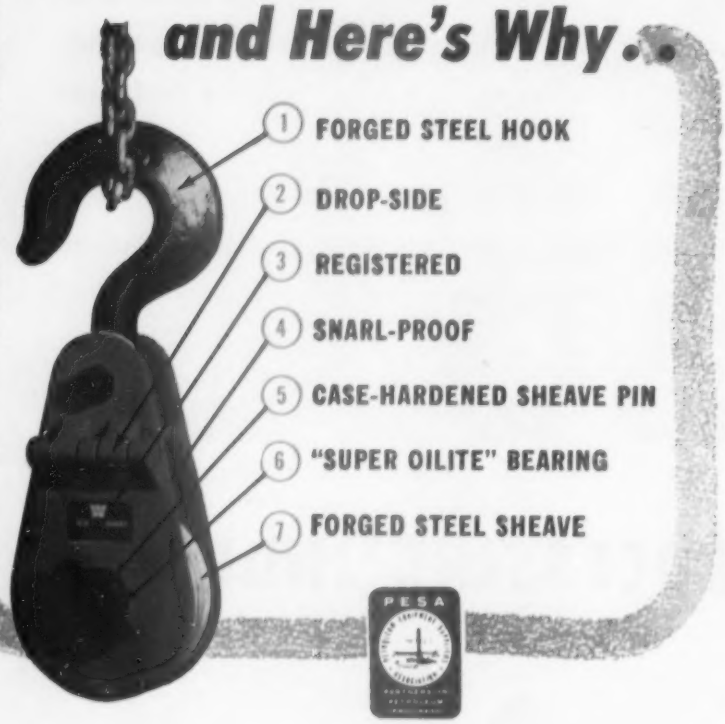


REPRESENTATIVES IN ALL PRINCIPAL OIL FIELDS OF THE WORLD

WECO

DROP-SIDE SNATCH BLOCKS

Your Best Buy and Here's Why...



These 7 great features assure superior service and performance. WECO Drop-Side Snatch Blocks are easy to handle . . . safer to use . . . have greater strength, safety and utility.

Sides are ⅜" steel plate. Hook or clevis is full swiveling. Wire line or manila rope cannot slip between sheave and side plates.

The patented WECO Drop-Side makes it easy to string or unstring the snatch block at any time. You just remove the wing-nut, raise the side, insert the line, drop the side and replace the wing-nut. Blocks are available in 6", 8" and 10" sizes.

Ask your Supply Store or industrial distributor for WECO Drop-Side Snatch Blocks.

it's wise to standardize with.. WECO

WECO ® WELL EQUIPMENT MFG. CORP. • Division of Chikvan Company • HOUSTON 1, TEXAS

11-17	Permian Basin Oil Show, Odessa, Texas
12-15	Eighth National Chemical Exposition, Chicago Coliseum, Chicago.
14-15	National Association of Corrosion Engineers, South Central region, Dallas.
14-17	Permian Basin Oil Show, Odessa, Tex.
17-20	American Institute of Mining and Metallurgical Engineers, petroleum division, fall meeting, Plaza Hotel, San Antonio.
18-19	Joint Lubrication Conference, American Society of Mechanical Engineers and American Society of Lubrication Engineers, Lord Baltimore Hotel, Baltimore.
21-22	Western Petroleum Refiners Association, regional meeting, Garrett Hotel, El Dorado, Ark.
24-26	Independent Petroleum Association of America, annual membership meeting, Mayo Hotel, Tulsa.
25-27	Diesel and Gas Engine Power Plant Operators Conference, sixth annual conference, Oklahoma A. & M. College, Stillwater, Okla.
25-27	National Lubricating Grease Institute, annual meeting, Mark Hopkins Hotel, San Francisco.
26-28	Society of Automotive Engineers, national diesel engine meeting, Statler Hotel, Cleveland.
29	Natural Gasoline Association of America, southern regional meeting, Blackstone Hotel, Tyler, Tex.

NOVEMBER

1-3	Geological Society of America, annual meeting, Statler Hotel, Los Angeles.
3-5	Gulf Coast Association of Geological Societies, fourth annual meeting, Rice Hotel, Houston.
4	American Association of Oilwell Drilling Contractors, third annual South Louisiana safety clinic, New Iberia, La.
4-5	Society of Automotive Engineers, national fuels and lubricants meeting. Mayo Hotel, Tulsa.
5	Southern Gas Association, conference on field production of natural gas, Herring Hotel, Amarillo.
8-11	American Petroleum Institute, thirty-fourth annual meeting, Conrad Hilton Hotel and Palmer House, Chicago.
11-12	American Association of Petroleum Geologists, Pacific section annual meeting, Biltmore Hotel, Los Angeles.
17-18	North Texas Section, American Institute of Mining and Metallurgical Engineers, and Production Committee of the North Texas Oil and Gas Association, symposium on secondary recovery, Wichita Falls, Tex.
18-19	National Association of Corrosion Engineers, fourth annual conference of western region, Hotel Biltmore, Los Angeles.
18-19	Society of Exploration Geophysicists, eighth annual midwestern meeting, Adolphus Hotel, Dallas.

28-Dec.

3	American Society of Mechanical Engineers, Statler Hotel, New York.

DECEMBER

2-4	Interstate Oil Compact Commission, winter meeting, Drake Hotel, Chicago.
2-4	American Chemical Society, Southwest Regional meeting, Fort Worth, Tex.
3	Natural Gasoline Association of America, Panhandle-Plains regional meeting, Herring Hotel, Amarillo, Tex.
12-15	American Institute of Chemical Engineers, annual meeting, Statler Hotel, New York.

IT'S YOUR $18,000,000

... who will you trust with it?

WHEN your company invests that kind of money in new plant construction you will have to have confidence—a lot of confidence—in the people you trust with the job.

You can find plenty of evidence of complete confidence in McKee among some of the world's largest corporations in the industries we serve. Most of the big names in these industries have called on us again and again for McKee design, engineering and construction services . . . the type of sound thorough efficient services you want for *your* money.

McKee Engineering Services

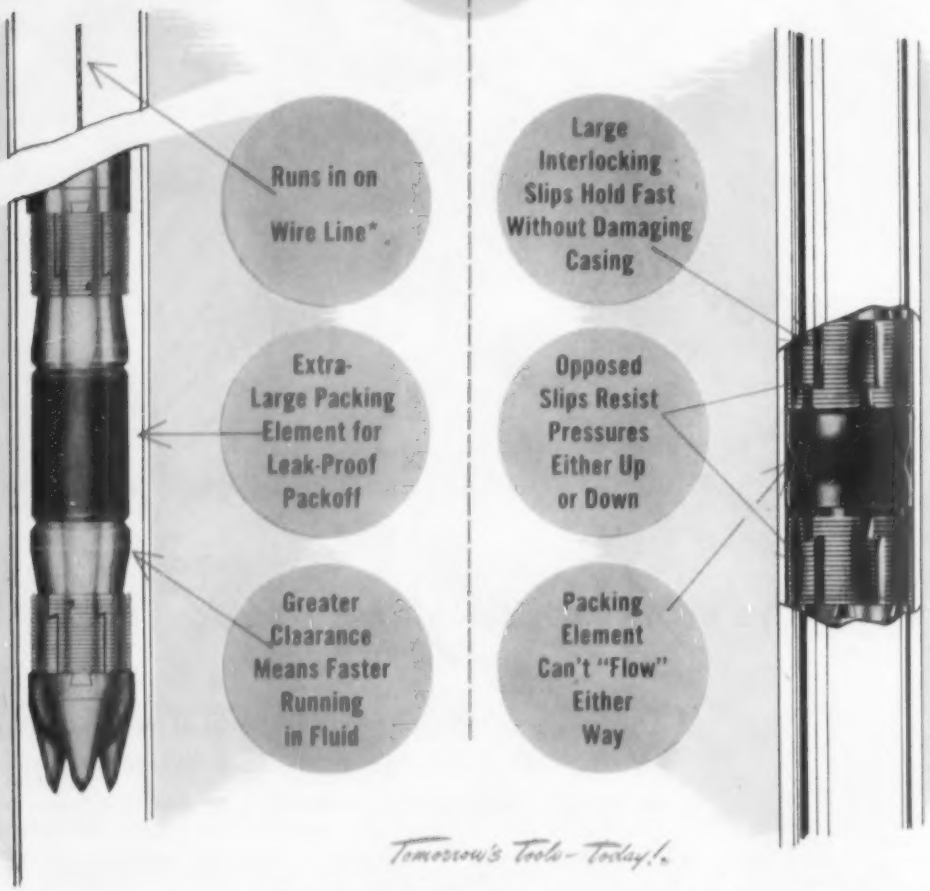
Arthur G. McKee & Company • Engineers and Contractors

Headquarters: McKee Building • 2300 Chester Avenue • Cleveland 1, Ohio
Offices: New York • Tulsa, Oklahoma • Union, N. J. • Washington, D. C.
British Representatives of Metals Division: Head, Wrightson & Co., Limited
Canada: Arthur G. McKee & Company of Canada, Ltd., 350 Bay St., Toronto

Let's Look

at the **operating advantages**

of these bridging plugs


Runs in on Wire Line*
Extra-Large Packing Element for Leak-Proof Packoff
Greater Clearance Means Faster Running in Fluid
Large Interlocking Slips Hold Fast Without Damaging Casing
Opposed Slips Resist Pressures Either Up or Down
Packing Element Can't "Flow" Either Way

Tomorrow's Tools - Today!

2 models *to fit every need*

MAGNESIUM for fastest drill-out...1 to 3 hours. Plugs rated up to 6,000 p.s.i.

CAST IRON, rated up to 10,000 p.s.i. Outlasts casing in permanent installations, yet drills out or knocks down in 4 to 6 hours.

LANE WELLS COMPANY

*L-W Hoist Trucks at 72 field locations

Drillable - Wireline Bridging Plugs

General Offices, Export Office and Plant • 5610 So. Soto St. • Los Angeles 58, California

Los Angeles • Houston • Oklahoma City • Lane-Wells Canadian Co. in Canada • Petro-Tech Service Co. in Venezuela

AU-708

THE OIL AND GAS

JOURNAL

TULSA, OKLAHOMA

Published every Monday by The Petroleum Publishing Co., 211 S. Cheyenne, Tulsa, Oklahoma. Phone 3-6291. Founded in 1902. Name changed to The Oil and Gas Journal in 1910 by Patrick C. Boyle.

●

P. C. Lauinger, President; S. H. Rourke, Executive Vice President; Mitchell Tucker, Vice President and Advertising Manager; Hanson B. Pigman, Circulation Manager; Donald W. Wilson, Manager, Industry Census Department; J. Parker Holland, Production Manager.

EDITORIAL STAFF

TULSA OFFICE, 211 South Cheyenne Avenue, Phone 3-6291: Kenneth B. Barnes, **Editor;** Henry D. Ralph, **Chief Editorial Writer;** Ted A. Armstrong, **News Editor;** Gerald L. Farrar, **Engineering Editor;** Dr. Frank J. Gardner, **Exploration Editor;** Paul Reed, **Pipeline Editor;** John C. Reidel, **Petrochemical Editor;** C. O. Willson, **Consulting Editor;** W. L. Nelson, **Technical Editor;** Lynn M. Nichols, **Presentation Editor;** John C. Casper, **Economics Editor;** Neil Williams, **Associate Editor;** Edwin McGhee, **Drilling-Production Editor;** Norman S. Morrisey, **Drilling-Development Editor;** Paul Swain, **Assistant News Editor;** Robert G. Deering, **Assistant Pipeline Editor;** R. B. Tuttle, **Equipment Editor;** W. A. Franklin, **Assistant to Presentation Editor.**

Tulsa District Editors: Carl Hoot, John C. McCaslin, John M. McGivern, and Carl J. Lawrence.

Tulsa Editorial Assistants: Helen Brown, Martha Allbright, Alice Burt, and Aileen Cantrell.

NEW YORK OFFICE: 500 Fifth Avenue, Phone LOngacre 4-6160; George H. Weber, **Refining Editor,** and Dahl M. Duff, **International Editor.**

HOUSTON OFFICE, 802 Sterling Building, Phone CHarter 4626: F. Lawrence Resen and William P. Sterne, **District Editors.**

DALLAS OFFICE, 1238 Mercantile Bank Building: Robert J. Enright, **District Editor.**

LOS ANGELES OFFICE, 650 South Grand Avenue, Phone VAndike 0722: D. H. Stormont, **District Editor.**

WASHINGTON OFFICE, 621 Albee Building, Phone DI 7-1710: Bertram F. Linz, **District Editor.**

Correspondents at Denver, Pittsburgh, Calgary, Columbus, Ashland, Ky., Oil City, Pa., and Mount Pleasant, Mich.

Advertising Offices: TULSA, John D. Reilly, Mid-Continent Manager, 211 South Cheyenne, Phone 3-6291; NEW YORK: Charles A. Wardley, Eastern Manager, and Robert N. Caird, Jr., Representative, 500 Fifth Avenue, Phone LOngacre 4-6160; CHICAGO: E. S. Klappenbach, Midwestern Manager, David T. Kenney and John D. Yoder, Representatives, 105 West Madison Street, Phone Central 6-2537; PITTSBURGH: Alfred M. Jones, Manager, 429 Fourth Avenue, Phone Atlantic, 1-4835; HOUSTON: John M. Spears, Gulf Coast Manager, Sterling Bldg., Phone CHarter 4626; DALLAS: George O. Ruppert, Representative, 1238 Mercantile Bank Bldg., Phone STerling 3074; LOS ANGELES: Donald O. Hanson, Manager, 650 South Grand Avenue, Phone VAndike 0722; ENGLAND: Harry Becker, European Representative, 111 Thorley Lane, Timperley, Cheshire, Phone Ringway 4702.

●

Subscription rate to the petroleum industry, United States and foreign, 1 year, $4.00. Single copies, 50 cents. Back copies when over a year old, one dollar. Note: Payments from outside the U.S.A. may be in the form of an international money order or check on a U.S.A. bank. Entered as second-class mail matter at Tulsa, Okla., under Act of March 3, 1879. Copyright 1954 by The Petroleum Publishing Co.

Member
Audit Bureau of Circulations
Associated Business Papers

JOURNALLY Speaking

HENRY D. RALPH, C.E.W.

HENRY RALPH, the originator and proprietor of this column, is on vacation. While he's south of the border, we'd like to tell you a little bit about him. He's the Journal's Chief Editorial Writer—a title that perhaps calls for some explanation.

What he does . . . Henry's foremost responsibility is the editorial. He has to be aware of the most significant happenings in the petroleum industry each week and, with the help of others, formulate Journal policy regarding these matters. Result, of course, is the editorial.

Then, besides the editorial and Journally Speaking, Henry is responsible for a large portion of our news coverage of the natural-gas industry. He's right on top of spot news, trends, and long-range developments that affect gas and related activities.

Henry attends all the Interstate Oil Compact Commission meetings and thus stays abreast of cooperative developments of the oil-producing states.

Then, too, he is charged by Journal management with interviewing as many operating oil men as possible, to ferret out industry-wide trends and thinking.

What he's done . . . Henry has been in the business of writing for a number of years, and has been with the Journal since 1937. He was the Journal's Washington, D. C., editor before coming to Tulsa in 1946. While in Washington, he was active in and served as secretary of the National Press Club.

He is the national president of the Association of Petroleum Writers, and is a past secretary-treasurer of this organization. He is a past president of the Tulsa Press Club.

Henry's first love is, of course, pounding a typewriter and putting together stories about the oil business. However, he is an after-dinner speaker of some renown, and likes to get on his feet to expound before a group of people. Latest engagement will take him to Bismarck, N. D., to address the North Dakota Oil and Gas Association.

Traveling Nurse

While on a recent trip to survey Gulf Coast petrochemical activities, one of our Journal staffers found a plant nurse who strays far from the beaten path in making her rounds.

She is Eula Ross, visiting nurse in the medical division of du Pont's Sabine River Works, Orange, Tex. Last year she traveled 13,098 miles making 1,247 visits to employes' homes.

Some of these homes are located in the Texas-Louisiana bayou country and are inaccessible by automobile. Eula then travels by boat, on foot, or uses any other means of transportation that happens to be available.

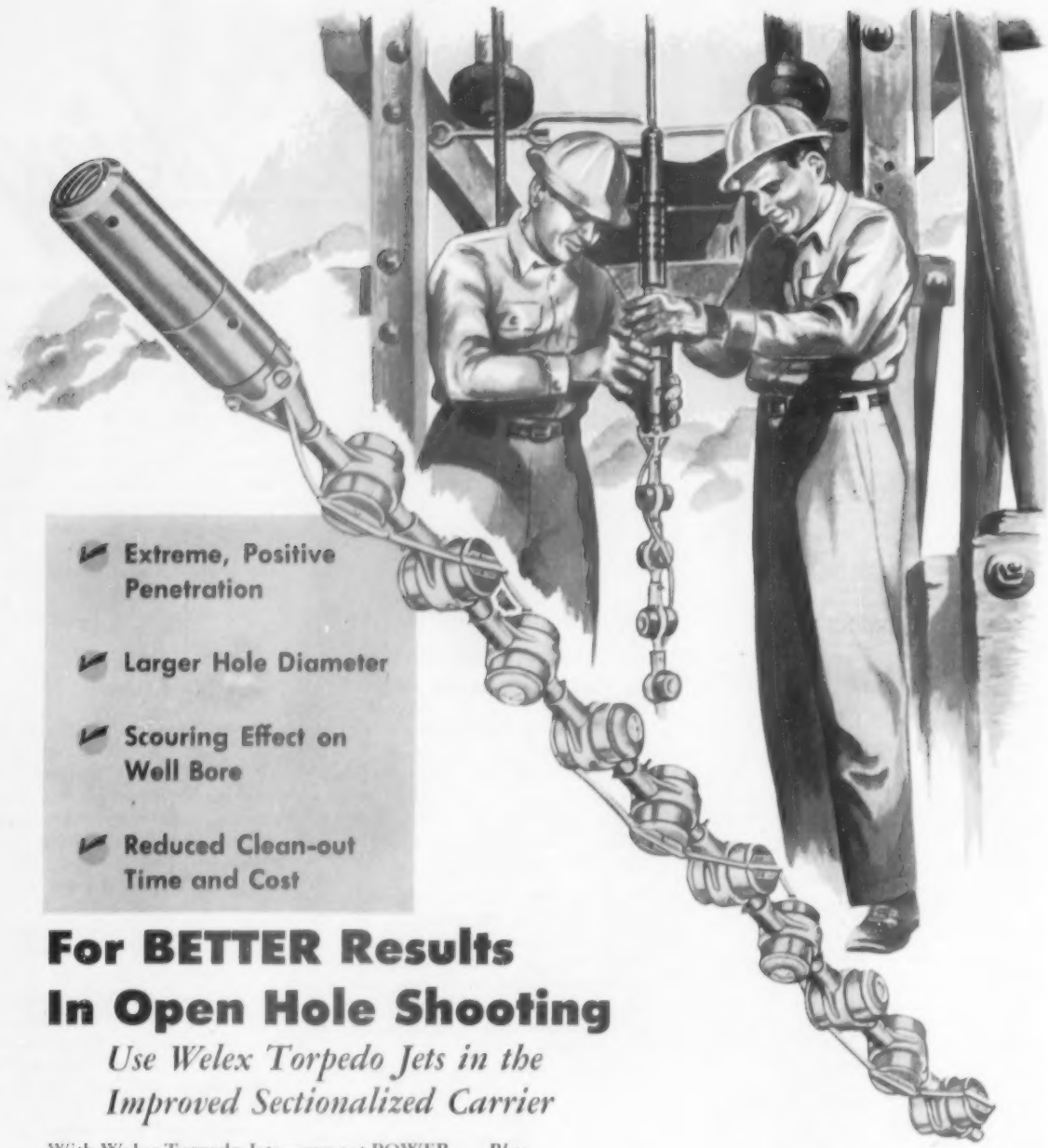
She never tells a patient to come back to work, never prescribes any treatment, and never takes any temperatures. Nor does she carry any medicine.

Eula summarizes her duties by saying, "I go to see our people simply for their own welfare. We want to know if they are under doctor's care, how they are getting along, and if there is any way we can help them.

"I talk to the folks, play with their children, and pet their dogs and cats. I love every minute of it. I guess they like it too, for I'm always received courteously, and they seem to look forward to my visits."

Just another example of how oil and petrochemical companies are ahead of the field in looking after their employes.

—Gerald L. Farrar



- Extreme, Positive Penetration
- Larger Hole Diameter
- Scouring Effect on Well Bore
- Reduced Clean-out Time and Cost

For BETTER Results In Open Hole Shooting

Use Welex Torpedo Jets in the Improved Sectionalized Carrier

With Welex Torpedo Jets—you get POWER . . . *Plus*.

The POWER packed in Torpedo Jets guarantees deep penetration, large diameter entrance holes, and a thoroughly-scoured well bore.

The *Plus* is in the new sectionalized Torpedo Jet Carrier made of brittle CAST aluminum which disintegrates into tiny particles upon shooting. These very small particles reduce or eliminate clean-out time—and keep costs down. For maximum results in open holes . . . use Welex Torpedo Jets *every time*.

ORIGINATORS OF Welex JET PERFORATING

Welex JET SERVICES, INC.

Call Welex and be SURE!

General Offices:
1400 E. Berry Street, Fort Worth, Texas

Division Offices:
Houston - Midland - Tulsa - Oklahoma City

District Offices: Abilene - Ardmore - Beaumont - Corpus Christi - Falfurrias - Gainesville - Great Bend - Hobbs - Houston - Lafayette - Liberal - Odessa - Pampa - Pauls Valey - San Angelo - Shawnee - Stillwater - Victoria - Wichita Falls

How to save money and gas too

WIDE spacing, or close—which is the better drilling pattern? That's an argument that has been going on among producers and reservoir engineers for years.

Many good examples are cited of fields which would produce just as much oil from half as many wells; likewise of fields which couldn't possibly produce as much oil under wide spacing.

So the controversy continues, and few state conservation bodies care to—or dare to—take a stand. By archaic regulation or custom, most new fields are drilled on relatively close spacing.

The trouble with the arguments on both sides of this question is that they generalize from specific instances. They assume that what was good for one field will automatically be good for all.

WHY NOT A FLEXIBLE POLICY based on trial and error but with the error of a sort which can be corrected later? Here's how: As soon as a discovery well is completed the conservation authority could establish temporary field rules requiring wide initial spacing—perhaps 80 acres or even more per well.

Then, as these wide-spaced wells outlined the field and revealed the characteristics of the reservoir, the size of the reserve, and the probable drainage and payout per well, in-fill drilling could be authorized on progressively closer spacing patterns—down to 10 acres or less if necessary—until all concerned are satisfied that the most oil will be recovered most economically.

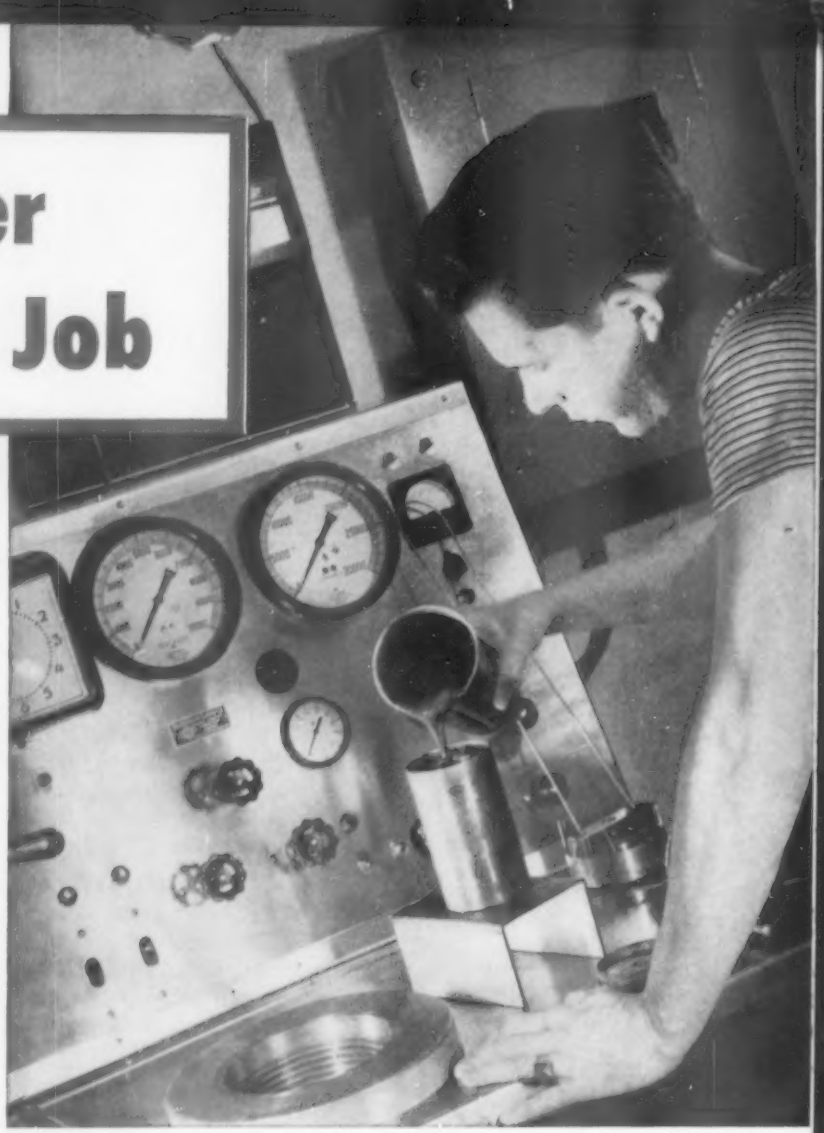
This procedure should cause no great hardship to anyone if there are proper provisions for unitizing surface interests within a drilling unit—which is the case almost everywhere except in Texas. It is always possible to drill additional wells; never possible to get back money wasted in unnecessary wells.

BUT THE GREATEST BENEFIT from such a procedure is the conservation of natural gas and its liquid products. Until a new field's reserves and producibility are established, it is seldom possible to secure a gas-line connection or to plan and finance a gasoline plant.

Much money will be saved if gas flaring is kept to the absolute minimum during the proving-up period and until gas-handling facilities are installed. Many of the field-wide shutdowns ordered in Texas to prevent gas waste in recent years might have been avoided if in-fill drilling had been deferred until all the gas could be utilized.

This suggestion promises to save money for the operators and conserve petroleum for the nation. It merits close study by the conservation authorities of several states.

For a Better Cementing Job



● Scratchers and centralizers illustrate the use of modern equipment in the field, for the purpose of overcoming adverse conditions down the hole.

To the same end, modern equipment employed in Oil-Well cement research—using A. P. I. testing procedures—makes it possible closely to simulate pressures and temperatures down the hole, and thus to produce cements for trouble-free cementing jobs.

This intensive laboratory research, based on continuing study of changing field conditions, keeps Lone Star Cements abreast of the times to meet the most exacting Oil Industry requirements.

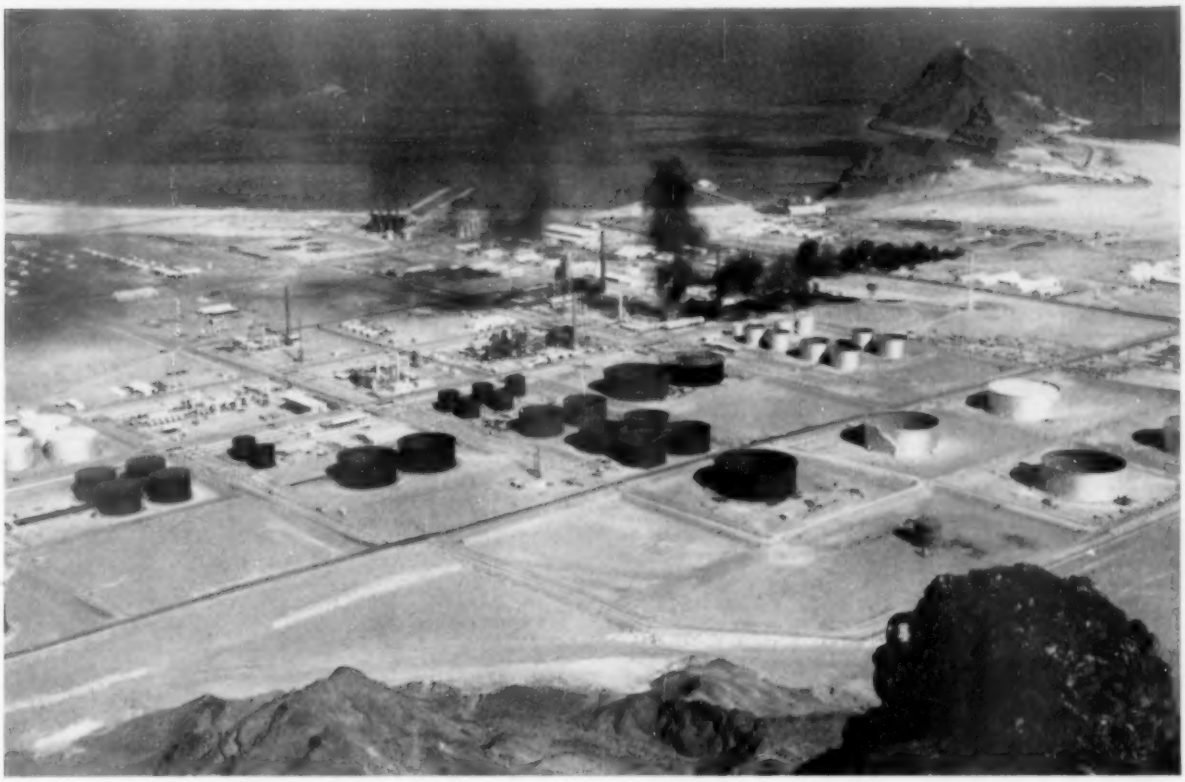
Standard Oil Co. (N.J.) Photo

LONE STAR CEMENT CORPORATION

Offices: DALLAS • HOUSTON • ABILENE, TEXAS
NEW ORLEANS • BIRMINGHAM • KANSAS CITY, MO.
ALBANY, N. Y. • BETHLEHEM, PA. • BOSTON • CHICAGO
INDIANAPOLIS • NEW YORK • NORFOLK • PHILADELPHIA
RICHMOND • ST. LOUIS • WASHINGTON, D. C.

Select Cement to Fit the Job!

THIS WEEK . . . . . IN THE NEWS



ANGLO-IRANIAN'S NEWEST 120,000-bbl. refinery occupies what was once just a stretch of sandy beach across the bay from the Port of Aden on the southern tip of the Arabian Peninsula. The first units of the new $150,000,000 oil processing center have just begun operation. The added capacity of the new units boosts Anglo-Iranian's world-wide refining capacity to almost the point it occupied before the loss of the Abadan refinery in the Iranian oil nationalization 3 years ago. The new Aden refinery went into production 4 months ahead of schedule and at the peak of construction had a work force of 14,000 men **(see story on page 109).**

GOVERNMENT—National Labor Relations Board establishes precedent in ordering Lion Oil to reimburse 600 employes for wages lost during 6-week strike. . . . ¶The President signs bills that will open way for construction of 20 high-speed tankers and for trade-in of old ships. . . .

INTERNATIONAL—Domestic oil producers need not get panicky over the Iranian oil settlement. . . . Resumption of operations is expected to have little effect on import picture here. . . . ¶Anglo-Iranian Oil Co., Ltd., gets major boost in refining capacity with opening of 120,000-bbl. refinery at Aden. . . . ¶Refining capacity in Latin America will rise nearly 10 per cent with completion of new plants during the coming year. . . .

REFINING—Socony-Vacuum plans to build nine more catalytic reformers in addition to four already building at subsidiary Mobilgas refineries. . . . Units planned as part of $165,000,000 spending program to end in 1956. . . . ¶Union Oil completes Platformer at Cut Bank, Mont., refinery. . . .

PRODUCTION—Fewer completions and less productive wells continue to force down California's crude production. . . . State currently producing 975,000 bbl. daily compared to 1,000,000-bbl. daily average last year. . . . ¶Richfield Oil is reviving Casmalia area wells after 28 years. . . . Twenty shut-in wells have been rejuvenated. . . .

INDUSTRY—Higher-octane gasoline may not be needed for the average car, but refiners are set for continuation of the octane race for several more years. . . . Revamping of Carthage Hydrocol gas-synthesis plant at Brownsville, Tex., to start late this summer. . . . Merger of oil and chemical workers into one union moves step closer as negotiations open in Washington. . . . Independent oil unions, also considering merger appear reluctant to join. . . . Two independents vote for merger with O.W.I.U., and three vote against it. . . .

PIPELINES—Construction contracts awarded for Arapahoe crude line from Merino, Colo., to Humboldt, Kans. . . . The line will move Denver-Julesburg basin crude to Sinclair's "big inch" line to the Chicago refining area. . . . ¶Transcontinental Gas Pipe Line Corp. places order for 50 miles of 36-in. pipe that will be used in Texas to New York looping, expansion program. . . . ¶Sunflower Pipeline, Inc., wins certificate from Kansas Corporation Commission to build 215-mile, 6-in. L.P.G. and natural-gasoline line from Sublette, Kans., to Wichita. . . .

ABADAN REFINERY, the world's largest, as it looked from the air before shutdown in 1950.

Where Iranian Oil Will Go

- Settlement of Iranian question poses little threat to U. S. producers; most of output to stay near home
- Iran faces stiff competition from other Middle East nations which captured market during long shutdown

Dahl M. Duff

Most of the crude and products to come from Iran will find a home in the Eastern Hemisphere, and the net effect of the settlement on the United States industry is expected to be negligible.

This isn't to say that some shipments from Abadan or Bandar Mashur won't be made next year to East Coast ports. But they probably will be at the expense of some other Middle East oil-producing country without any over-all increase in the amount of foreign crude moving into this country.

One main reason is that the importing companies know any substantial increase would be highly dangerous politically. One official put it this way:

"It's all wrong to think that restarting in Iran, with American company participation, means an automatic increase in imports. If these companies wanted to step up their imports, they could have done it a year ago. There hasn't been any lack of crude oil."

U. S. gets little Iranian oil . . . Oil from Iran was never an important part of total U. S. imports, even in the pre-nationalization heyday when Anglo-Iranian Oil Co., Ltd., was turning out 600,000 to 700,000 bbl. daily as the largest operator in the Middle East. The shipments began in July 1948 and ended in March 1949. Bureau of Mines figures show an average of 12,000 bbl. daily in 1948 and 3,000 bbl. daily in 1949. Only once after this does Iran show on the import record, and that was for an insignificant 4,000 bbl. daily in 1950.

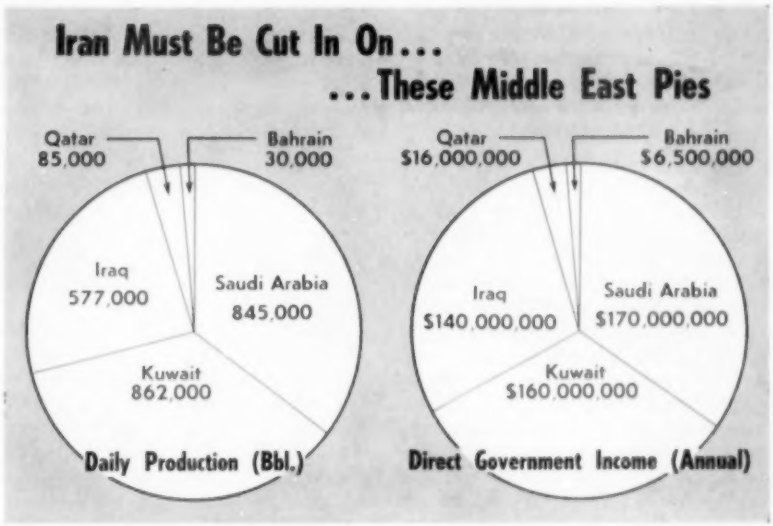
Under the agreement which the eight-company international consortium reached with Iran, the companies are pledged to produce a minimum of about 300,000 bbl. daily the first year, 460,000 bbl. daily the second, and 600,000 bbl. daily the third. If the agreement goes through as expected, this first year of operations will coincide with 1955, since an initial starting-up period of three months is provided before the production guarantees come into effect.

Although the consortium gave Iran no guarantees as to minimum levels of refinery operation, it hopes to be able to maintain Abadan's throughput at about half the crude production rate. This leaves about 150,000 bbl. daily of crude oil as such to be absorbed. This production will elbow into markets now supplied by Saudi Arabia, Kuwait, and Iraq. Abadan's products output will be reflected in diminished runs by other foreign refineries now dependent on an export trade.

I.P.A.A. spokesman calm . . . Russell Brown, general counsel of the Independent Petroleum Association of America and chief spokesman for domestic producers, showed no particular alarm over the Iranian settlement.

"In view of the fact that the operators in the Middle East and other countries stepped up their operations to take care of the market vacated by Iranian nationalization, it would be assumed that these same ventures would reduce the market to give Iranian oil a part, at least, of the part it formerly occupied. Failure to do this would have serious impact on Western Hemisphere oil," he said.

"With the current supply situation in the United States, it would be disastrous should any of this oil seek a market here. Certainly, the importing companies would not want to further aggravate the situation now existing here."



Door open to other U. S. firms . . . While present indications point to an unchanged rate of United States imports despite the reemergence of Iran, some additional shipments to the United States could result if other American companies buy into the consortium. The five now involved—Standard Oil Co. (N.J.), Socony-Vacuum Oil Co., Inc., The Texas Co., Standard Oil Co. of California, and Gulf Oil Corp.—have outlets and ways of disposing of Iranian oil in the Eastern Hemisphere. Whatever other American companies might come in probably would do so with the idea of United States imports in mind.

The arrangements that have been made for formation of the consortium definitely leave the door open for inclusion of other responsible American companies if they desire to participate. The over-all limitation on the total American interest is 40 per cent. The State Department presumably is ready to clear the way for other American partners. The main requirement is that they put up the money and be ready to take a share of production in proportion to their interest.

Additional oil shipments into the United States stemming from the Iranian settlement would upset the recent reductions and trend toward a more stabilized rate of imports. A succession of importing companies in June announced cuts in their schedules ranging from 10 to 14 per cent, and these are expected to show in fourth-quarter totals.

Other countries profit . . . Even without Iran, Middle East imports, all of it crude oil, have nearly doubled since the last full pre-nationalization year of 1950. Last year's average was 259,000 bbl. daily compared to 114,000 bbl. daily in 1950. The peak from the Middle and Far East came in the second quarter of last year when the average was 288,000 bbl. daily. In the current quarter, these imports are totaling about 271,000 bbl. daily.

Though political considerations virtually prohibit increasing United States imports, the pressure will be on the Middle East producing companies. The production increases to which Saudi Arabia, Kuwait, and Iraq have become accustomed over the last 3 years will become a thing of the past, and cutbacks are not out of the question. It's never easy to trim back a budget, even though these countries know they have been riding high on Iran's misfortune.

Production figures over the next year will show which of these countries will feel most of the effect of reopening the Iranian oil fields. In 1953, these three countries—Saudi Arabia, Kuwait, and Iraq—produced 94 per cent of the Middle East's total 2,426,000 bbl. daily.

Saudi Arabia may suffer . . . Saudi Arabia's output may be particularly hit because this oil is largely sold for dollars. Many markets in the Eastern Hemisphere more readily take sterling oil which is produced by all other countries of the Middle East except Saudi Arabia. On the other hand, the big interest in the consortium is held by companies which now draw on Iraq and Kuwait. Anglo-Iranian, with 40 per cent interest in the consortium, owns half the Kuwait concession and turned most heavily to this operation when it replaced its Iranian supplies 3 years ago.

If everything goes as planned, first exports from Iran may begin around October 1. A team of legal experts is drafting the detailed agreement in Teheran, and the boards of the consortium companies are scheduled to give formal approval in the near future. Incorporation of the operating companies also must be carried out.

The principal hurdle still remaining is ratification of the agreement by the Iranian parliament. The deal with the consortium, and the accompanying British-Iranian accord on compensation for Anglo-Iranian is due to be submitted as soon as the legislators reconvene August 24. Iranian politics always carries a highly unpredictable element, but the general feeling is that the agreement will win ratification with the support of the Shah and the government.

As soon as this important preliminary is over, the consortium will move quickly to reactivate the properties on a large-scale basis. Crude shipments can begin almost immediately at Bandar Mashur, the other Iranian oil terminal on the Persian Gulf. Some dredging will have to be carried out in the Shatt-el-Arab River which leads into Abadan. Most reports indicate the National Iranian Oil Co. has maintained the producing and refining equipment as well as possible, but there has been some inevitable deterioration, especially at the refinery.

Details not disclosed . . . The announcement of the agreement in Teheran August 4 and statements made by Howard Page, the chief consortium negotiator, on his return to New York 4 days later, gave a picture of the plan under which the consortium will carry out Iranian oil operations. Still to be disclosed, however, are the details of the actual consortium organization itself.

Of special interest is the amount of money Anglo-Iranian will receive from the other consortium partners. Reports

both in the United States and London mention $600,000,000 as the price on the 60 per cent interest not held by Anglo-Iranian. Whether this will be partly as oil payment and over what period of time is not known.

If the $600,000,000 is correct, the American companies will be out $80,000,000 each, assuming the total 40 per cent American interest is split evenly among the five. The sum Anglo-Iranian receives from the American companies, from Cie. Francaise des Petroles for its 6 per cent, and Royal Dutch-Shell for its 14 per cent, compensate Anglo-Iranian for the properties and rights it is giving up in Iran. In addition, from Iran, Anglo-Iranian gets $70,000,000, spread over 10 years, for the small Kermanshah refinery, the nearby Naft-i-Shah field, its Iranian distribution properties, and as compensation for losses over the last three years in replacing its oil supplies.

Biggest deal in history . . . The sum involved in the Iranian settlement and the consortium organization ranks the entire transaction as the biggest in the history of private business. Considering the 40 per cent interest Anglo-Iranian will retain, it indicates a total valuation of the concession properties and rights in excess of a billion dollars.

Many of the terms of the Iranian agreement resemble closely the 50-50 profit-sharing agreement which Iraq Petroleum Co., Ltd., made 3 years ago with the Iraq Government. In Iran, however, instead of a concession carrying ownership rights, the companies have a contract bestowing full rights to exclusive use and complete management of the properties. Page said the rights were "just as effective" as ownership and the distinction was a fine, legal one. Under the Iranian nationalization law, vesting outright ownership of the properties in the consortium or any other private group was forbidden.

Here are the main features of the Iranian agreement:

Operations . . . Two consortium companies will be incorporated in the Netherlands and registered in Iran, one to carry out exploration and production and the other, refining operations. Iran will nominate two of the seven board members, and will vest in these companies full and effective management of the operations.

The National Iranian Oil Co. will handle all functions not directly related to producing, refining, and transportation, and will be reimbursed by the consortium operating companies. This includes housing, medical care, public transport, industrial training, road maintenance, etc. The feeling is that this arrangement is all to the benefit of the consortium. These side activities are a burden to the operating companies elsewhere in the Middle East.

It is believed the consortium can function with only a relatively small number of foreign technical and administrative personnel in Iran, possibly not more than 200. Only about 14,000 of the present Iranian force of 26,000 may be required. In 1950 Anglo-Iranian employed a total force in Iran of 61,740, including 2,725 British and 1,778 of other foreign nationalities.

The agreement provides for the organization of two other consortium companies, to be incorporated in Britain. One will be a holding company between the consortium partners and the two operating companies. Another British company will handle purchasing and service activities for the operating companies.

Agreed rates of production . . . The production guarantees of about 300,000, 460,000, and 600,000 bbl. daily in the first 3 years are intended to allow the "orderly" reintroduction of Iranian oil into world markets. After the first 3 years, the consortium pledged itself to take "quantities reasonably reflecting the supply and demand trend for Middle East crude oil, assuming favorable operating and economic conditions in Iran."

Operating Abadan at a rate equal to about half the crude production would bring the refinery, once the world's largest, up to about half its former 500,000-550,000 bbl. daily throughput.

Oil purchasing arrangements . . . Each of the companies participating in the consortium will establish a trading company in Iran which will acquire title at the well head to its proportionate share of the oil. These companies will buy the oil from the two operating companies at cost plus a fee of about 2 cents a barrel.

The trading companies will engage only in the export trade, selling f.o.b. Iranian ports at prices each of them will post individually. This in effect bars discounts such as those at which owning companies have bought oil from their producing subsidiaries in other Middle East countries. These discounts are being eliminated elsewhere in the Middle East.

Income for Iran . . . Under the proposed level of operations, Iran will receive an income equivalent to about $87,000,000 in the first year of operations. This will rise to $188,000,000 in the third year.

The agreement provides that Iran will receive a royalty of 12½ per cent, or one-eighth. This will be paid by the trading companies as they take title to their share of the production. Iran can elect to take its royalty in kind in which case it is turned over to the National Iranian Oil Co. free of cost. The "in kind" provision is designed to allow Iran to check the accuracy of the export prices charged by the trading companies by offering its oil on the international market.

The profits of the trading companies are subject to a 50 per cent Iranian income tax, and the 12½ per cent royalty will be credited against these income tax payments. To meet demands of the Iranian market over the Kermanshah production, the National Iranian Oil Co. can buy any refined products normally manufactured at the refinery. For this, it will pay the consortium operating company the same charge, cost plus about 2 cents a barrel, as the individual trading companies pay.

Other features . . . The agreement has a basic term of 25 years and provides for three 5-year extensions. Earlier reports said the approximately 100,000 sq. miles in which the consortium will hold exclusive exploration and production rights would have to be reduced by 20 per cent with each 5-year extension of the agreement. These boundaries differ considerably from the old Anglo-Iranian concession.

Page estimated that the profit to members of the consortium would amount to about 80 cents a barrel on crude oil and around 85 cents on products, on the basis of present prices and the operating levels to be reached by the third year. This is the amount that will accrue to the companies after payment of operating expenses and royalty and taxes to Iran.

Clauses in the agreement giving the companies freedom in the choice of tankers to transport Iranian oil protect the consortium against arrangements such as that negotiated by A. S. Onassis, Greek shipowner, with the Saudi Arabian Government. This widely protested agreement allows Onassis certain preferential rights for the use of his ships in the movement of Saudi Arabian production.

The Iranian settlement also provides for revision in case any other Middle East country obtains better terms in an oil contract. This provision is standard in most Middle East concession agreements.

Work under way on revamping of huge gas-synthesis plant

BROWNSVILLE, Tex. — Stanolind Oil & Gas Co.'s huge project here to revamp and recondition the idle gas-synthesis plant of Carthage Hydrocol, Inc., will pick up steam late this month.

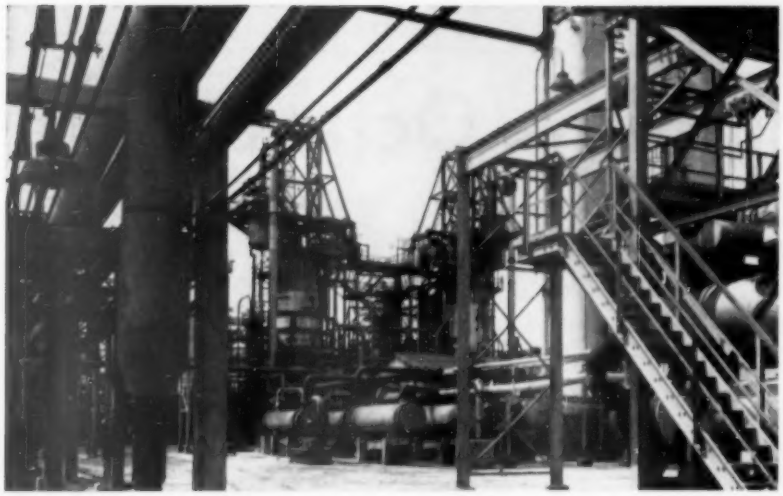
Lummus Co. crews will move into the plant August 30. By next February the company expects to hit a peak of activity with 700 men engaged in the overhaul project. Stanolind at present has 150 men doing reconditioning and maintenance work at its three plants here.

Principal jobs at the gas-synthesis plant include: Complete reinsulation of the oxygen plant, construction of a new gas generator, modification and repair of an existing generator, modification of the synthesis reactors, and major repairs and modification on much of the auxiliary equipment.

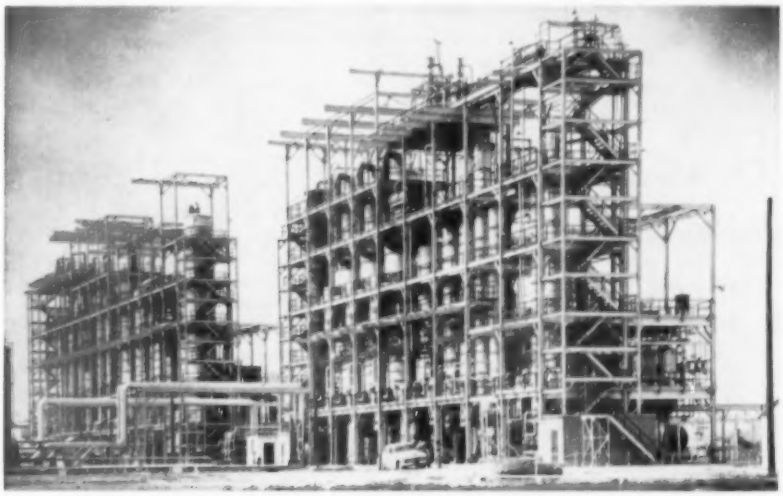
The $50,000,000 Carthage plant, only one of its kind, was designed to convert 90,000,000 cu. ft. of gas and 280,000,000 cu. ft. of air daily into an output of 6,000 bbl. of gasoline, 900 bbl. of diesel fuel, 200 bbl. of fuel oil, and 300,000 lb. of chemicals.

The novel plant, however, was plagued by shutdowns and at its best never exceeded one-third of its capacity. Late last year all nine owners wrote off their investment and turned the plant back to Reconstruction Finance Corp., which held a first mortgage of $18,500,000.

Stanolind, which had done much of the pilot-plant work on the process, acquired Carthage Hydrocol and assumed the RFC loan.



SYNTHESIS PLANT at Brownsville processes natural gas, converts it into synthetic gasoline, fuel oil, and other conventional oil products. By-product chemical stream goes to . . .



CHEMICAL PLANT nearby, which separates the chemical streams into alcohols, aldehydes, ketones, and acids. These purified products then are piped to . . .

STORAGE TERMINAL formerly owned by U. S. Industrial Chemicals, Inc., now taken over by Stanolind. Purified byproducts of original synthesis operation here are stored and prepared for shipment to waiting markets. Storage terminal is just south of Stanolind chemical plant and has rail-loading facilities.

What's Behind the Octane Race

- Competition within the industry, rising compression ratios, fight over additives are principal incentives
- Prestige, too, may be a factor as advertising men consider benefits of plugging 100-octane super premium

George Weber

MOST observers agree the present level of octanes in gasoline is higher than it need be to satisfy all but a small percentage of cars on the highways.

The rise in quality during the past year must be attributed mainly to competition within the oil industry and to a lesser extent to pressure from new-car owners. This internal competition arose from two principal causes—softening gasoline markets and preignition. Both combined to keep premium and regular octanes on the rise.

As no refiner needs to be told, new plant construction in this country has caught up with demand and the industry has reverted to normal in having a margin of excess capacity. Over use of this excess in the face of disappointing demand weakened the market and gave the refiner a good reason to increase gasoline quality to maintain his gallonage. This buyer's market looks likely to continue for a year or two, and sales departments will remain sensitive to octane increases.

It is estimated that over 75 per cent of capital investments in new refining facilities now under construction is directed at improving quality and yield of products, principally gasoline, and only 25 per cent is directed toward outright expansion of refining capacity.

The preignition problem is credited with having directly and indirectly forced octanes up appreciably during the past year. As compression ratios rose, car manufacturers, refiners and tetraethyl lead manufacturers noted that in a growing number of cases the suppression of preignition required a higher octane rating than the suppression of autoignition or ordinary knock.

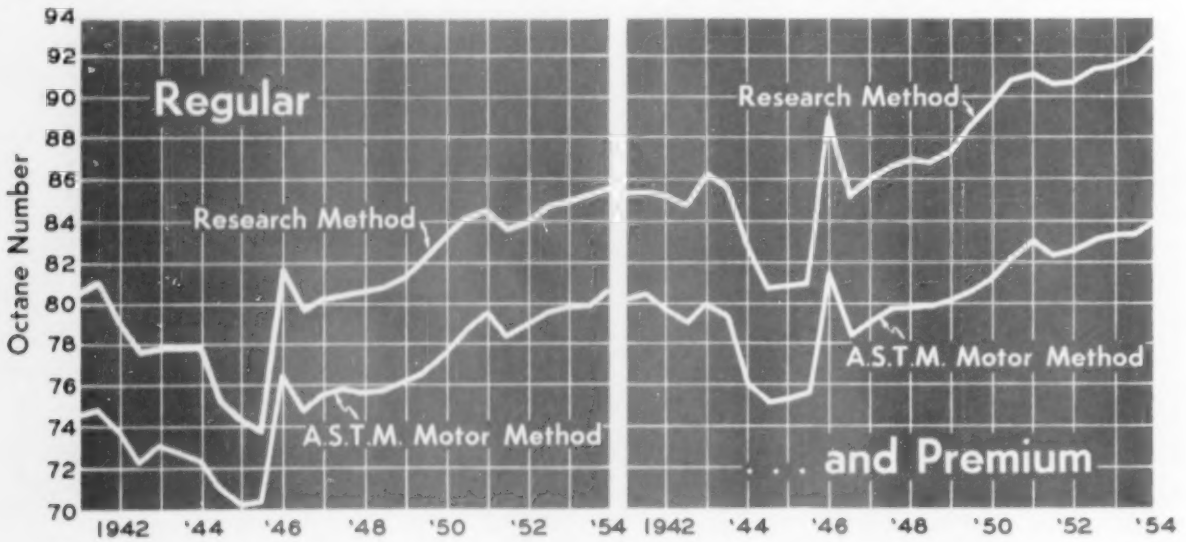
Effect of additives . . . This growing effect of a long-known phenomenon caused some marketers to up their octane to take care of critical cars. The introduction of the preignition additive also had an indirect effect on octanes. The purpose of the additives, according to those who blend them, is to reduce the over-all octane requirement of motor fuel by supressing preignition. The net effect, however, has been to raise octanes because of the battle over additives and octanes.

Some companies who have used the gasoline additives are reliably reported to have scored important gains in gallonage although, strangely, no competitors admit to losing business. Some companies opposed to the use of additives, retaliated by upping octanes. Those in the additive camp in turn advertised that they offered additives and high octanes as well. The net result was higher octanes across the board—additives or no additives.

The additive-octane debate has by no means subsided. Approximately 60 companies are now offering additives in their gasolines. These include the brands of five large refiners, numerous medium and small refiners, wholesalers and jobbers.

A reliable calculation based on current premium gasoline sales shows that between 35 and 40 per cent of all such gallonage now contains some additive designed to improve combustion. Included are the brands of two majors whose nonphosphorous additives are generally considered apart from the phosphorus additive specifically designed to combat preignition and spark plug fouling. These nonmetallic additives are commonly termed combustion improvers. Premium gasoline contain-

The Trend in Octanes Since the Beginning of World War II



RELATIVE CAPACITIES OF 19 LARGEST UNITED STATES REFINERS

Company*—	No. ref.	Crude capacity	Thermal cracking Capacity	Thermal cracking Per cent crude	Catalytic cracking Capacity	Catalytic cracking Per cent crude	Catalytic reforming Capacity	Catalytic reforming Per cent crude
Standard Oil Co. (N. J.)	8	976,900	196,600	20.1	440,000	45.0	57,800	5.9
Socony-Vacuum Oil Co., Inc.	13	696,075	220,661	32.6	323,792	46.5	47,000	6.7
Standard Oil Co. (Ind.)	13	690,600	350,250	50.8	254,750	36.8	107,200	15.5
Gulf Oil Corp.	8	602,910	170,582	28.3	218,430	36.2	72,160	12.0
The Texas Co.	13	583,500	221,600	37.9	198,000	34.0	113,130	19.4
Shell Oil Co.	6	554,000	186,000	33.6	193,000	34.8	47,800	8.6
Standard Oil Co. of California	8	470,500	169,150	36.0	138,200	29.4	75,450	16.0
Sinclair Refining Co.	7	425,000	126,000	29.6	153,000	36.0	38,000	9.0
Cities Service Oil Co.	4	264,000	26,300	10.0	112,000	42.5	27,500	10.4
Phillips Petroleum Co.	6	249,300	62,700	25.2	118,000	47.4	23,000	8.8
Sun Oil Co.	2	246,750	45,340	18.4	170,300	69.0	48,940	19.8
Union Oil Co. of California	5	231,440	97,500	42.2	47,800	20.7	23,100	10.0
Atlantic Refining Co.	2	224,329	31,635	14.1	95,460	42.5	19,100	8.5
Tide Water Associated Oil Co.	4	217,500	61,700	28.4	64,200	29.5	10,000	4.6
Pure Oil Co.	6	182,100	68,900	37.8	65,650	36.1	8,000	4.4
Standard Oil Co. (Ohio)	4	150,000	59,500	39.7	51,000	34.0	12,000	8.0
Continental Oil Co.	8	143,670	41,300	28.8	51,365	35.8	18,750	13.1
Ashland Oil & Refining Co.*	5	104,500	30,000	28.7	37,000	35.4	6,000	5.7
Richfield Oil Corp.*	1	140,000	52,000	37.1	60,000	42.8		

*Including subsidiary companies.

ing detergents was excluded from the foregoing figure.

More automotive pressure . . . While frank observers within the industry will admit that oil company competition has spurted octanes within the past year, they expect renewed pressure from automotive circles in 1955. The rather drastic increases in compression ratios of 1953 models took up much of the slack in available octane, and played an important part in precipitating the preignition troubles of a year ago.

This year's models moved up slightly in average compression ratios, to about 7½ to 1. The increase in 1954 was mild by comparison with the year previous. The upward move in octanes, incited largely by oil industry competition of the past year, has created some more octane margin, and car makers are expected to take advantage of it in upping the average of compression ratios for 1955 models.

Although specific plans are kept secret, expert observers of Detroit seem to feel that compression ratios will tend to close the gap between 7 and 8½ to 1, and that the average will move up generally toward the higher figure next year. One or two makes may step out to 9 to 1, in the opinion of some.

Auto makers with engines designed to take higher compression ratios are studying the octane trend closely. They may be expected to raise their requirements as high as they dare, keeping right on the heels of the octane race.

The 100-octane appeal . . . In recent months another factor in octane incentive has entered the picture. Recalling the successful response of the motoring public to a recent sales and advertising campaign on a premium gasoline, sales departments throughout the industry have begun to eye the 100-octane super-premium possibility with new interest.

Admittedly, this is a dream for the present. But there is an undeniable appeal to the "100-octane" tage. As the average octane level of premium gasoline approaches 98, or even 97 it is highly probable that some company will step out to 100 with fanfare designed to augment prestige, gallonage, and it is hoped, profits.

To date there is nothing to the "100-octane" talk which anyone can put his finger on. It is believed too far in the future to name any likely candidates. Individual companies are understandably cagey in discussing such possibilities, generally denying interest in making the move themselves and suggesting who else might make it.

The conjecture on 100-octane premium has more than mere gossip value. It is recognized by many observers as an important coming factor in raising fuel quality. The company to initiate the jump to 100 will probably not be alone for long, for others with the ability are expected to follow suit quickly. Thus, as levels approach that figure, they may take an abnormal spurt which could be attributed to nothing more than the magic attraction to gasoline buyers of 100 on the scale.

Pros and cons . . . The degree of enthusiasm for 100-octane premium in sales departments is not matched in the manufacturing or treasury departments of oil companies. There are a great many good reasons for calling it a will-o-the-wisp right now.

It is rightly argued that such a move might be impractical for a major company marketing gasoline over a wide geographical area. No major company names octane numbers in advertising today for the good reason that they vary from area to area. Currently, Middle Atlantic and Gulf Coast markets are selling premium three research numbers higher than in the plains states and five higher than in the Rockies.

This would tend to leave the initiative to a company whose market embraces a particular section of the country, perhaps the East Coast. Such a move would undoubtedly be matched by companies with more widespread activities, although they might restrict their 100-octane to competitive areas.

Some observers believe the geographical octane differential is due to shrink. Automotive companies are understandably anxious to utilize the highest octanes they can in their new models. Their compression ratios must be uniform throughout the country, hence they are exerting pressure on marketers in the low octane areas (except the Rockies) to close the gap with the high octane areas.

The difficulty in extracting any large volume of 100-octane fuel from a high level pool is cited by others as a serious deterrent to the sales department's dream. In some pools consisting largely of cat cracked and cat reformed stocks, which can be leaded to 98, it may be impossible to extract any appreciable 100-octane fraction. Although polymer can be used to raise a fraction to the 100 mark, its blending value is relatively less for the higher octane stocks, and the polymer content would be economically prohibitive for premium fuel at a price resembling the present one.

Technology improving . . . The progress of technology will in all probability bring this barrier down. Some refiners believe that their existing equipment will produce better octanes with improvements in catalysts and better oper-

PROCESSING CAPACITIES OF UNITED STATES REFINERS

Size of company—	No. ref.	Crude capacity	Per cent of total	Thermal cracking		Cat cracking		Cat reforming		Polymerization	
				Capacity	Per cent crude	Capacity	Per cent crude	Capacity	Per cent crude	Capacity	Per cent crude
Large	123	7,153,000	80.9	2,218,000	30.7	2,792,000	39.1	755,000	10.5	105,000	1.5
Medium†	34	781,000	8.8	175,000	22.4	253,000	32.5	96,000	12.3	21,500	2.6
Small‡	171	911,000	10.3	224,000	24.6	184,000	20.3	95,000	10.5	18,500	2.0
Total	328	8,845,000		2,617,000	29.7	3,229,000	36.6	946,000	10.7	145,000	1.6

*19 companies controlling 100,000 bbl. per day or more in crude capacity. †20 companies controlling 25,000 to 99,999 bbl. per day in crude capacity. ‡152 companies controlling less than 25,000 bbl. per day in crude capacity.

ating and regenerating techniques. Before ruling out the technical possibilities of 100-octane premium, experts should recall that serious barriers to 95-octane premium existed not too long ago.

The profit picture in 100-octane premium is a dim one to some refiners. It is pretty generally agreed that at the present state of the art and at current prices, such a high quality fuel is impractical.

There is a widespread feeling among refiners that premium gasoline should command a greater price differential over regular today. Whether this will happen cannot be guessed, but a few extra-premium brands are presently doing well at higher-than-premium prices.

For example, one independent found no measurable price resistance to his high-octane grade at 1 cent above the market and is now wondering if it would not have been successful with a 2-cent differential. Such cases are limited and do not indicate a trend at the present time. At the proper time, however, a 100-octane super-premium grade might command a sizable price differential over other premium brands, and this possibility is being weighed.

Octane timetables . . . Engineers who must plot possible octane trends in the future agree fairly closely in predicting an average leaded premium level of about 97 research by 1959. Regular is expected to average close to 90 research by that time. The geographical gap on octane will probably close to some extent in 5 years.

Consensus seems to be that the East and Gulf coasts will average about 98 on premium, while the Central West, and Mid-Continent areas will follow closely with 97, 96, and 95-octane averages respectively. In view of past predictions on the low side, some who go along with these estimates also note that they may be conservative.

The geographical difference will remain greater in regular brands, due mainly to the stimulus of single-grade marketers in the East and in various localized sections elsewhere. Where single grades are marketed, competitors raise regular grade octane higher than they would otherwise. Five years hence, regular is expected to reach an average of about 91 in the East and 90 on the Gulf Coast. The remainder of the country will probably trail the East by 1½ to 2 numbers in the central and western areas and 4 numbers in the Mid-Continent.

The ratio of premium to regular is expected to continue its current moderate raise. Premium sales amounted to over 40 per cent of the total at the close of the war, then dropped to a low of about 28 per cent in 1950. Since that time, the annual average has edged upward, at 30.5 per cent last year, and is expected to reach 31 per cent in 1954. These are yearly averages. The ratio varies seasonally, being high in winter and dropping when farm consumption of nonpremium grades picks up in the spring. So far this year premium sales have varied from 34 to less than 30 per cent.

Octane positions . . . The independent refiner is faced with many serious economic problems today. Without minimizing these problems, however, it should be pointed out that as a class the medium and small refiner is in a good competitive position with the majors so far as processing facilities are concerned.

On the average, the major has retained a higher capacity in thermal cracking than have smaller companies. Large refiners have kept ahead of smaller competitors in the building of catalytic cracking capacity, with an average of 39 per cent of crude as compared with the national average of 36.6.

But in catalytic reforming and polymerization, both highly important in the octane picture today, the smaller refiners still have a definite edge.

In all size groups there are individual companies which stand out ahead of the average in their ability to produce octanes. The highest ratios of catalytic cracking and reforming capacity to crude capacity are bunched among the smaller refiners. In many instances they lead the market in their local areas and in many others they have been processing on contract with major marketers for the supply of high-octane stocks. With many majors now able to meet their marketing needs from their own expanded capacity, some medium and small suppliers are in jeopardy of losing their contracts. Some market observers, however, expect that most of these contracts will be renewed in view of the coming competition expected for octane.

Some small plants already approach the ultimate in design for gasoline yield and quality. An example of what the future refiner may have at his disposal is seen in a small refinery recently designed to serve the eastern market. This plant will maintain a catalytic cracking capacity of 56 per cent of crude capacity and over 100 per cent including fresh feed and recycle charge to the reactor. Cat reforming facilities will run 17 per cent of crude capacity, the maximum since no thermal cracking is anticipated and only virgin naphthas will be available for conversion.

The small company will show a definite octane advantage in the light-ends department. A high conversion level will result in a heavy production of cracked gases which will produce 3.6 per cent polymer and 6.4 per cent alkylate on the basis of crude charge. This combination will permit the production of a 4 per cent yield of 100/130 and 115/145 avgas with enough high octane stocks left over to market a regular motor fuel which can be brought above 95 research octane with TEL, and an equal volume of premium grade with a clear octane rating of about 95 research.

Another example of the ultimate

GASOLINE YIELD AND QUALITY
(Three hypothetical refineries)

Processing capacity, per cent on crude:	A	B	C
Catalytic cracking	48.0	48.0	48.0
Catalytic reforming	0.0	9.6	26.5
Coking	12.0	12.0	12.0
Polymerization (prod. capacity)	3.6	3.6	3.2
Gasoline composition, per cent total pool:			
Light straightrun naphtha	33.4	35.1	6.2
Heavy straightrun naphtha	17.8	0.0	0.0
Catalytic cracked	38.0	38.0	39.2
Coker gasoline	4.7	5.0	0.8
Reformate	0.0	16.0	47.8
Polymer	6.1	5.9	6.0
Gasoline yield, per cent crude runs	59.4	56.3	52.0
Pool R.O.N., clear	74.0	81.0	90.0
Pool R.O.N., + 3 ml. TEL	87.0	92.0	98.0

which can be reached with presently known techniques is outlined in the table on three hypothetical refineries. The study on which the table is based was presented early this year in a paper by W. M. Holaday of Socony-Vacuum Laboratories. ("What Can We Get From Higher Octane Number Fuels," presented at the annual meeting of the Society of Automotive Engineers, Detroit, January 11-15.)

Gas turbines and crystal balls . . . There will come a time, say some prophets in the engine and fuel business, when all this occupation with octanes will pass away. They foresee the day when jets will take over in the air and the gas turbine, diesel, or other devices insensitive to octane will supplant the spark ignition engine on the highways.

These visionaries are not as wild-eyed as they may seem. They grant that the gas turbine must be much improved before it could be considered for wider use. Even then, there remains the question of availability and cost of scarce materials needed for its manufacture.

The question of economy always arises in discussing future engines. Some believe that the gas turbine can prove competitive. Others point out that unless the price of crude and gas turbine fuel greatly increases, economy may not represent as important a factor as the engineering purists believe. The present motorist is cited as placing performance and power above economy. This same attitude may sell the gas turbine before it has been brought closely in line on miles-per-gallon or miles-per-dollar.

The diesel engine is receiving new attention with the introduction of a diesel-powered imported passenger car to United States markets. Performance and economy are understood to be good. Diesel trucks are common today. But the swing to diesel cars, if it materializes at all, will be a gradual evolution, say the experts. Under the present direction which petroleum processing techniques have taken, it would be difficult and costly to increase the yield of high quality diesel fuel appreciably.

Some observers feel that any decision to move away from the high octane-high compression engine combination will await the day when present engines have reached the maximum ratios for which they are designed (10 to 12:1). That future date may see octanes in the 100-plus range, bumping the quality ceiling even with advanced processing techniques.

The consensus remains that higher octanes are going to occupy the refiner's attention for several years to come.

Reformers Planned

Socony to add 9 units to 4 now under construction

NEW YORK.—Socony-Vacuum Oil Co., Inc., will build nine more catalytic reformers in addition to four now under construction at Mobilgas refineries in the United States.

The units form an important part of a construction program which calls for capital expenditures of $165,000,000 at the company's refineries in 1954, 1955, and 1956.

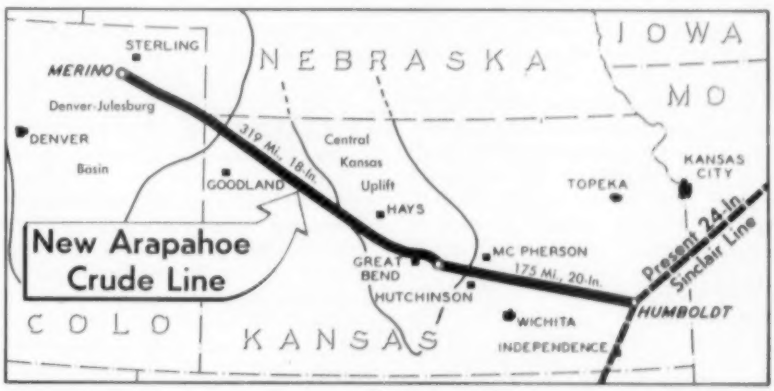
Of the company's four units now under construction, two are 19,000-bbl. Thermofor catalytic reformers and two are Sovaformers of 3,000 to 6,000 bbl. The TCR's are being erected at the Torrance, Calif., refinery of General Petroleum Corp., Socony's West Coast affiliate, and the Beaumont, Tex., refinery of Magnolia Petroleum Co., Socony's Southwest affiliate.

The 6,000-bbl. Sovaformer is being built at General Petroleum's Ferndale, Wash., refinery, now under construction and the 3,000-bbl. unit is being constructed at Socony's Augusta, Kans., refinery. All four units are scheduled to go on stream by the first of 1955.

Planned units . . . The planned construction will include Sovaformers only. Units are scheduled for Socony's refineries at East Chicago, Ind.; Paulsboro, N. J.; Trenton, Mich.; East St. Louis, Ill.; Casper, Wyo.; Buffalo, and Brooklyn. Sovaformers will also be built at Magnolia's Beaumont and General's Torrance refineries.

When completed, the units will give Socony a total reforming capacity of more than 130,000-bbl. per day.

Socony's new capacity will boost the total reforming units operating or being built to above the 1,000,000 bbl. mark at the beginning of 1955. *(This is in line with a survey published by The Oil and Gas Journal August 9, page 64, which showed reforming capacity for the beginning of 1955 before the Socony announcement would be 946,-000 bbl.)*



New Outlet for Colorado Crude

INDEPENDENCE, Kans.—Arapahoe Pipe Line Co. has let contract for construction of an 18 and 20-in. crude line from Merino, Colo., to Humboldt, Kans., and E. W. Unruh, president of the company, said construction will start immediately.

Delivery of pipe for the $25,000,000 system started late last week. The system will move crude from the Denver-Julesburg basin to Sinclair Pipe Line Co.'s "big inch" line going to refineries in the Chicago area. It is scheduled to go into operation early next year.

Capital stock of the newly-formed Arapahoe Pipe Line Co., is owned by Pure Oil Co. and Sinclair Pipe Line Co. Sinclair will supervise construction of the system and will operate the line as agent for Arapahoe.

Successful bidders on the project are:

. . . R. H. Fulton & Co., Lubbock, Tex., 149 miles of 18-in. line from Merino to Colby, Kans.; 162-miles of 18-in. line from Colby to Schurr Station, Kans., and 84 miles of 20-in. line from there to Burns, Kans.

. . . Panama-Williams Co., Houston, 86 miles of 20-in. line from Burns to Humboldt.

The new line will have an initial capacity of 80,000 bbl. daily. In addition to Colorado crude, it will pick up approximately 30,000 bbl. daily from the Central Kansas uplift.

Merger Move Grows

Independent oil unions hesitant to join forces

WASHINGTON.—The Oil Workers International Union moved a step closer to merging with its fellow C.I.O. affiliate, the Gas, Coke and Chemical Workers Union, last week but efforts to bring independent oil unions into the big family apparently have bogged down.

Officials of the two big unions were optimistic about the outcome of merger negotiations as a 24-man rank-and-file committee met here to draw up a constitution for the proposed organization, which would represent approximately 200,000 workers.

Attending the meeting, in addition to the dues-paying members, were O. A. Knight, president of the oil workers union; Elwood D. Swisher, president of the gas, coke, and chemical workers; and Richard Leonard, assistant to C.I.O. President Walter Reuther.

Knight, whose union represents nearly 130,000 workers and would dominate the new organization, expressed confidence that the merger will be approved. Similar optimism was voiced by Leonard, who presided at the talks.

Both officials said there was no serious opposition to the consolidation, although many conflicting views would have to be reconciled. Any agreement reached here would be submitted to the two unions in separate conventions later this year.

Other proposal separate . . . Attempts to merge the two big unions are being kept apart from the plan to consolidate all oil and chemical unions into the International Oil and Chemical Workers Union proposed at a joint convention in Philadelphia earlier this year *(The Oil and Gas Journal, March 1, page 45)*. It is expected that if the current negotiations result in an amalgamation of the big oil and chemical unions efforts to enlist the smaller unions will be renewed.

The Philadelphia meeting last February was attended by representatives of 31 unions. A provisional constitution was drawn up and a convention to complete the merger was set for Aug. 23 "or as soon thereafter as reasonably possible." The meeting, however, has been indefinitely postponed, presumably because smaller unions showed little interest in joining.

Small unions split . . . So far, five smaller unions have voted on the merger plan. Three of them turned it down, while two of them expressed a willingness to follow the O.W.I.U. proposal.

Voting overwhelmingly against the merger plan were union workers at Standard Oil Co. (Indiana) refineries in Whiting, Ind., and Casper, Wyo. Both groups were affiliated with the Central States Petroleum Union, whose 30,000 membership makes it the second largest organization represented at the February meeting. However, the Whiting union, formerly designated as local 100 of the C.S.P.U., has withdrawn from the parent organization.

The merger movement also was vetoed by the 1,300-member Independent Oil Workers Union of Oklahoma, representing Continental Oil Co. employes at Ponca City.

Those favoring the proposal, in addition to O.W.I.U., were C.S.P.U. local 101 at Sugar Creek, Mo., and the Texaco Employes Association at Bayonne, N. J.

L.P.G. Pipeline Approved

TOPEKA.—Sunflower Pipeline, Inc., has been granted a certificate by the Kansas Corporation Commission to build a 215-mile, 6-in. natural gasoline and L.P.G. pipeline from Sublette in western Kansas to Wichita.

The line will have a daily capacity of 30,000 bbl. About 50 miles of gathering system is planned in the Sublette area.

J. B. Harshman, Tulsa pipeline consultant, is president of the new company. Harshman is a veteran pipeliner, having served for many years with the system now known as Service Pipe Line Co.

No construction date has been announced, but the company has indicated it will start about 45 days after receiving the certificate.

Shale Oil Advice Asked

WASHINGTON.—Members of the National Petroleum Council's agenda committee are being polled on request of the Interior Department for advice with respect to further government development of processes for the manufacture of oil from shale.

A survey team which studied the activities of the Bureau of Mines' experimental work at Rifle, Colo., has recommended the work be discontinued. Recent discussions between department officials and oil companies have centered around the sale of the Rifle facilities or their operation under a cooperative plan.

Industry Briefs

WASHINGTON.—Sealed bids for an oil and gas lease covering 66.14 acres of land within the known geologic structure of the Bell Springs field in Garbon County, Wyoming, 16 miles northwest of Rawlins, will be opened by the Bureau of Land Management August 18.

SWEETWATER, Tex. — Honolulu Oil Co. along with Payne, Johnson & Byars, of Tyler, are building a gasoline recovery plant 15 miles east of White Flat pool. The $1 million plant is scheduled for completion by December 15. Gasoline Plant Construction Co. of Houston is the contractor.

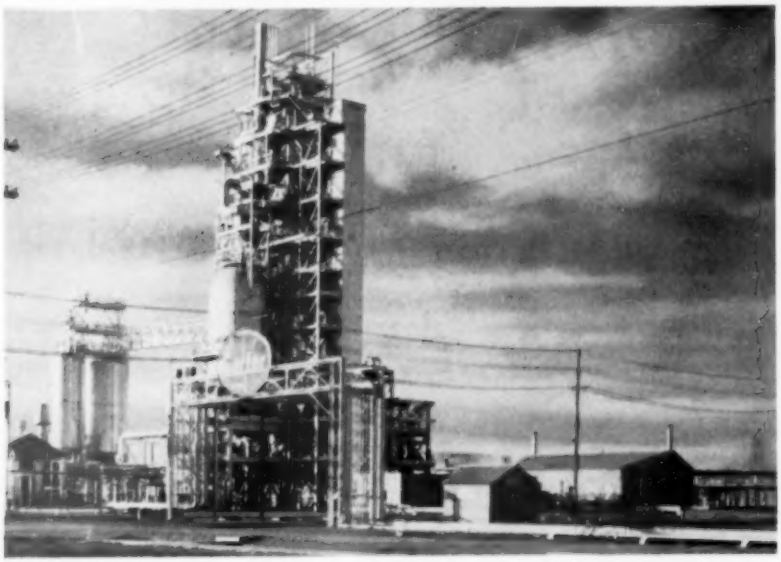
HOUSTON.—University of Houston will offer a B.S. degree in geophysics for the first time this fall in line with its recent decision to expand the physics department curriculum and research program. Much of the increased staff research will be in the electronic field of nuclear physics.

LOS ANGELES.—Union Oil Co. of California has acquired 25 parcels of land between Fifth and Maryland, and Bixel and Boylston streets, on which it plans to erect a height-limit office building. The company has set no construction date.

HOUSTON.—Continental Oil Co.'s largest refinery at Ponca City, Okla., reduced runs by 25 per cent of July beginning August 1. The figure represents a 32 per cent reduction under June runs to stills. The company previously made reductions in runs at its refineries in Billings, Mont., and Denver.

CLEVELAND. — Sohio Petroleum Co., subsidiary of Standard Oil Co. (Ohio), cut purchases of Kansas crude oil to 70 per cent to the June level beginning August 1. The reduction applies to purchases of crude from leases served by the Kaw Pipe Line Co. in the state. In July Sohio reduced its purchases in Illinois, Indiana, and Kentucky at leases served by Sohio Pipeline Co. to 70 per cent of June purchases.

EDMONTON.—Hupp, Ltd., of Edmonton, has been awarded a contract to construct a 30-mile, 10-in. natural-gas pipeline to link the Coleville gas field to the Saskatachewan Power Corp.'s Brock-Saskatoon pipeline.



ROCKY MOUNTAIN CRUDE furnishes feed stock for this 10,000-bbl. fluid cat cracker towering over the entrance to the Billings, Mont. refinery of Carter Oil Co., one of 39 refiners in the Rocky Mountains.

Group 3 pricing complicates

Refining in the Rockies

C. O. Willson

DENVER.—Thirty-nine plants which constitute the refining industry of the Rocky Mountain area, as a group, have most of the problems that confront refiners generally and in addition have some peculiarly their own.

In most instances over the past year they have seen their realizations go down and their costs up but they are still in the black and hope to remain there.

They are still plagued with senseless pricing practices. While practically no Oklahoma gasoline moves into the area, spot and contract sales in substantial quantities are still based on Group 3 or Mid-Continent quotations with concessions to buyers not justified by comparative costs.

With natural gas services covering most of the area residual and diesel fuel use expanding fuels move slowly from most refineries. Operators are devising means of reducing yields with complete coking the objective of several refinery owners.

The mountain refiners do have at least one break. Their customers are less octane conscious than motorists in other parts of the country, a situation brought about partially by the higher altitude which tends to reduce knocking in engines.

According to a recent survey, the average antiknock rating of premium gasoline in Denver and Salt Lake City —two largest marketing centers of the Rocky Mountains—is 89.7 with 1.83 cc. of lead. The average for the regular grade is 82 with 1.7 cc. of lead. Both the ratings and lead use are substantially below the adjoining regions and also the national average.

A development contrary to this low octane status is apparent in Montana. When the Yellowstone Pipe Line Co. starts operating this month it reportedly will deliver 86 octane regular and 93 octane premium to Spokane and the intermediate delivery points. This action is said to have been brought about by conditions prevailing in Spokane and the general upward trend in Montana ratings over the past year. There are predictions by some of higher octanes in both grades of motor fuel in Colorado and Utah in the near future.

In common with refiners everywhere, Rocky Mountain operators are giving consideration to possible changes in the posted prices for crude oil to more accurately reflect refining values. Here as elsewhere there are postings based on gravities which cannot be justified by comparative yields in modern processing methods.

"Major" and "Independent" . . . Refining in four Rocky Mountain states varies from the skimming plants of a few hundred barrels daily capacity to refineries which can be classed as semi-major which are modern in every respect. Three have been built since the close of World War II.

The capacity relationship between the "major" and "independent" refiners is about the same as that which prevails in the oil country generally. There are 16 refineries owned and operated by integrated companies and they account for 208,337 bbls. or 73 per cent of the total crude oil capacity. The remaining 23 independent refineries have a capacity of 78,360 bbls daily or 27 per cent of the total.

The Rocky Mountain states could be broken down into two general classifications as to methods of marketing. The smaller refineries for the most part serve local markets. Five refineries located in Denver dispose of practically all of their output within a radius of 50 miles. Several others sell their output by truck and tank car within 200 miles of their refineries.

But the larger refiners are finding it increasingly necessary to depend on distant markets in selling a large part of their output.

Market encroachment . . . Much is being said and written explaining how new pipeline outlets for Rocky Mountain crude over the past 18 months have taken markets away from some of the fields of the Southwest and Middle West areas. It is true that new pipeline outlets to the east from the Rocky Mountains have furnished strong competition to the Mid-Continent and other areas. This has been aggravated by the fact that the crude market generally has been weak.

But Rocky Mountain refiners are also familiar with competition brought about by changed conditions. The situation at Spokane, Wash., is a case in point. While most of that area market is outside the Rocky Mountain states it has always been a desirable outlet for mountain refiners since the days when products were moved long distances by tank cars.

To save a part of the Spokane market and important intermediate outlets it has been necessary for mountain refiners to build two long-distant product pipeline systems. The Salt Lake Pipe Line Co.'s line which formerly

Rocky Mountain Refining Capacity

(Barrels daily)

State—	No. of plants	Crude-oil capacity	Thermal cracking	Catalytic cracking	Catalytic reforming	Poly-forming	Lubes	Coke	Asphalt
Colorado	7	34,050	3,200	6,810		740			2,500
Montana	11	68,710	14,550	24,630		1,570			9,750
Utah	6	73,100	8,450	37,500		400	120		800
Wyoming	15	110,837	25,048	39,975	1,500	2,151	650	*218	9,866
Total	39	286,697	51,248	108,915	1,500	4,861	770	218	22,916
Per cent of U. S.	11.8	3.4	2.0	3.8	0.6	4.7	0.4	2.8	7.1

*Tons.

terminated at Pasco, Wash., last year was extended to Spokane. The Yellowstone line connecting Spokane to Billings and Laurel refineries will be in operation this fall. Spokane is also served by tanker and barge shipments to Pasco from California refineries. Next year Spokane will also be within the marketing range of the new refineries now being built in northwest Washington.

Deliveries can also be made from Sinclair, Wyo., via Pioneer Pipe Line Co. (Sinclair and Continental) to Salt Lake City where shipments are tendered to the Salt Lake line (Standard of California).

It is said that mountain refiners will have a delivered price advantage in serving the Spokane area over outside refiners. This is particularly true of intermediate delivery points located in the mountain states. All these activities in serving the 65,000 bbl. daily Spokane market reflect the efforts being made by mountain refiners to protect their intra-area and adjoining markets.

A somewhat comparable situation exists in western Nebraska, western Kansas and parts of South Dakota. Within the past 4 years this has become a highly competitive marketing area with deliveries from product terminals of lines extending north from the Mid-Continent. Truck and tank car shipments also are made directly from Kansas refineries. This situation has threatened the exclusion of mountain refiners in this market although based on comparative mileage their border areas were logical outlets.

The Frontier Refining Co. with a 15,000 bbl. refinery at Cheyenne is solving this competitive problem with a 6-in. product line from the refinery to North Platte, Neb., with a terminal at Sidney. The line is owned by a Frontier subsidiary, the Wyoming-Nebraska Pipe Line Co. This line will also connect to the product line of the Wyco Pipe Line Co.

The Billings-Laurel refiners are also strengthening their marketing position through the independently owned Oil Basin Pipe Line Co.'s facilities connecting their plants in Glendive, Calif., to the east. This line is now under construction.

Processing facilities . . . The processing facilities of the four-state refineries reflect both the types of crude oil available and the marketing needs.

Because of the relatively low octane requirements, catalytic reforming is confined to one 1,500 bbl. unit. The total polyforming capacity for the production of high octane blending components is relatively high.

The catalytic cracking capacity in relation to crude runs is in line with the national average. These facilities plus thermal cracking and polyforming give a gasoline and naphtha yielded of 47.8 per cent, below that of several refining areas, but above the national average by 3.3 per cent.

Because of limited demands and the types of crude oils, Rocky Mountain refiners have an average yield of only 1.5 per cent for kerosine. A distillate yield of 22.6 per cent fairly well balances out with the yearly requirements for that product. The railroads absorb a large part of the distillate as diesel fuel.

The mountain refiners have reduced their yield of fuel oil to 22 per cent but it is still too high. Natural gas and diesel fuel have taken a large part of this market although there are still a few scattered local users which can be supplied at satisfactory prices. But a large part of the fuel oil has to be disposed of in competition with Mid-Continent and Middle West refineries through high cost tank car shipments with net backs to the plants which are ridiculously low.

There is some coking because of this situation and great interest is apparent in the new-type coker being installed at the Billings, Mont., refinery of the Carter Oil Co.

Rocky Mountain refiners are second only to California in the production of road oils. Several refiners have the right type crude oil to manufacture road oils and they have a large market because Rocky Mountain highways are largely constructed of that product and asphalt.

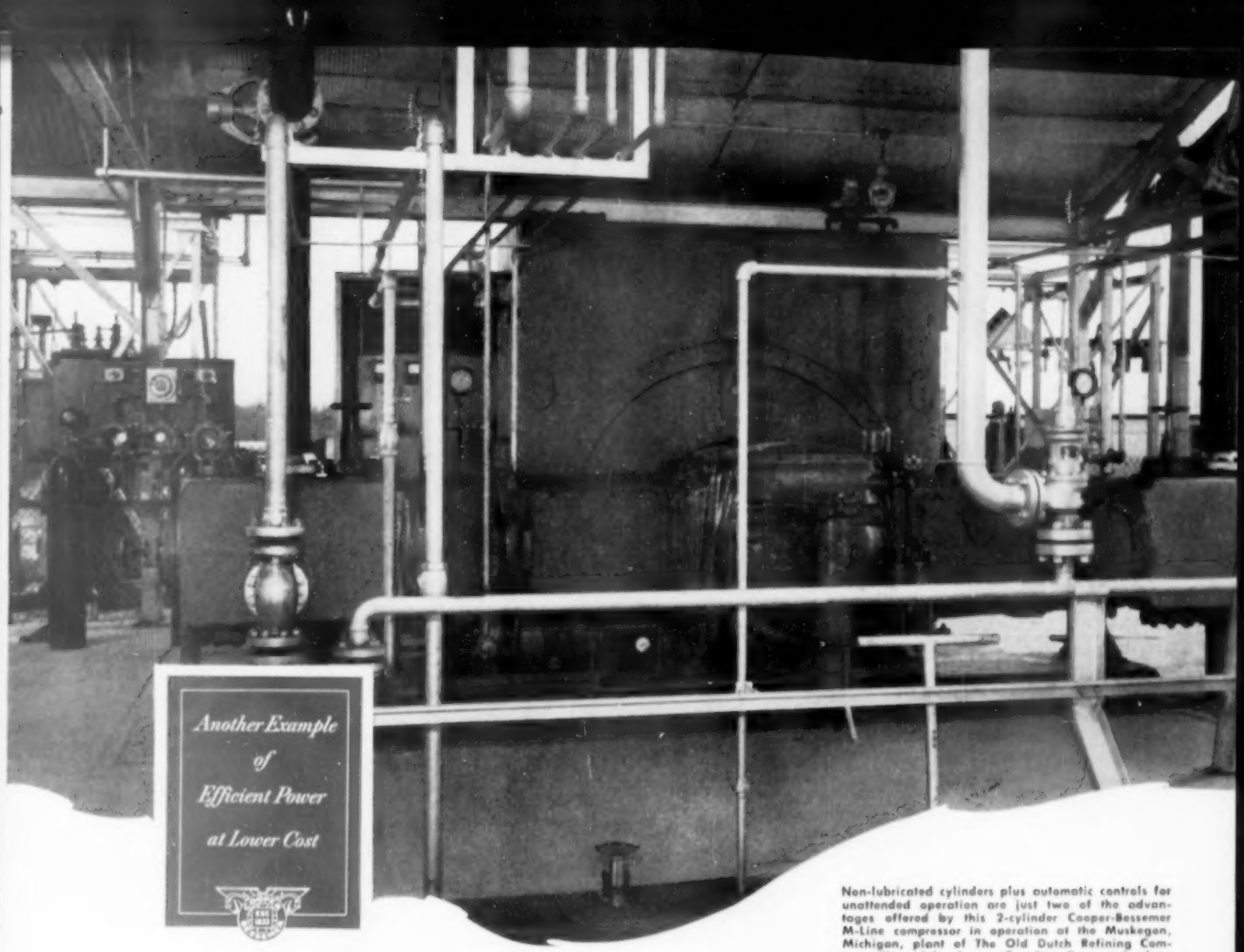
Crude pricing . . . Reference was previously made to the fact that some refiners feel present schedules do not accurately reflect refining values. Postings generally recognize the 2 cents per degree of gravity differential with prices on Rocky Mountain postings 13 cents per barrel under the Mid-Continent.

There is an active demand for certain crudes in Wyoming and Colorado while other crudes have inadequate outlets. Actual yields of light products, antiknock ratings of straightrun gasoline, yields of intermediates suitable for cracking stocks, yields of residuals, and sulfur properties of the crudes vary widely. This results in wide fluctuations in refinery value which are not reflected in present postings at the wells.

It is predicted that a general change will be made in crude postings in the area, revising prices so that they more nearly reflect today's refining values.

Marketing . . . The use of Oklahoma (Group 3) postings as a base for spot or contract sales in the mountain areas is no longer justified, representative refiners say. They cite the case of a small Denver refinery forced to sell for Denver tank-wagon delivery about 2 cents per gallon above Oklahoma base tank-car prices in order to meet competition. No Oklahoma products were involved by sellers.

It is felt that tank-wagon schedules as established by the large refiners are fair and more accurately reflect crude oil, processing and transportation costs. Most sales by integrated and independent units are based on these postings. These, however, are often disturbed by obsolete pricing methods.



Non-lubricated cylinders plus automatic controls for unattended operation are just two of the advantages offered by this 2-cylinder Cooper-Bessemer M-Line compressor in operation at the Muskegon, Michigan, plant of The Old Dutch Refining Company (leased by Aurora Gasoline Company) where the UOP Platforming process is in use.

"HYDROGEN COMPRESSES CLEAN"

... with Cooper-Bessemer's non-lubricated cylinders

RECYCLING millions of cubic feet of hydrogen a day for the UOP Platforming of low-octane gasoline, demands continuing efficiency from a smooth working compressor that will not contaminate the recycle hydrogen. That is one of the reasons why The Old Dutch Refining Company, leased by Aurora Gasoline Company, recently installed a 2-cyclinder Cooper-Bessemer FM compressor in their modern plant in Muskegon, Michigan.

To avoid contaminating hydrogen with oil in the recycle gas, Cooper-Bessemer successfully developed a non-lubricated compressor cylinder.

Operating against micro-smooth hardened cylinder liners, these 8″ diameter carbon pistons require no lubrication whatever. With a mirror finish, the cylinder bores reveal no excessive wear.

No matter how exacting or complex your compressor problems, check the advantages offered by Cooper-Bessemer M-Line compressors. For dependability and money-saving operation, you can rely on Cooper-Bessemer — one of America's oldest engine builders offering the latest in engineering advancements.

MOUNT VERNON, OHIO

COOPER-BESSEMER

GROVE CITY, PENNA.

New York City • Seattle, Wash. • Bradford, Pa. • Chicago, Ill. Houston, Dallas, Greggton, Pampa and Odessa, Texas Washington, D. C. • Shreveport, La. • San Francisco, Los Angeles, Calif. • St. Louis, Mo. • Gloucester, Mass. • New Orleans, La. • Tulsa, Okla. • Cooper-Bessemer of Canada Ltd., Edmonton, Alberta—Halifax, Nova Scotia.

DIESELS • GAS ENGINES • GAS-DIESELS • ENGINE-DRIVEN AND MOTOR-DRIVEN COMPRESSORS

Strikers Win Suit

NLRB orders Lion Oil Co. to reimburse 600 workers

WASHINGTON. — In a precedent-making decision, the National Labor Relations Board last week ordered Lion Oil Co., El Dorado, Ark., to reimburse 600 employes for the loss of 6 weeks' wages incurred when the company refused to reinstate them following a strike in 1952.

The board held that strikers do not lose protection of the Taft-Hartley Act because of striking if the shutdown occurs at least 60 days after notice of a labor dispute has been given to the employer and if the notice is served at least 60 days before the date for termination or modification of a contract.

The board itself emphasized the significance of the case, pointing out that it involved an important issue which has seldom required construction by the board.

Lion Oil and the Oil Workers International Union (CIO) entered into a contract in 1950 for an indefinite period subject to cancellation on notice by either party. The duration clause permitted 60 days' notice to amend on or after August 24, 1951, and if the parties did not agree on a new contract after that period a further 60 days' notice to terminate the contract completely.

Reinstatement delayed . . . The union served notice on the company August 24, 1951, of its desire to amend the contract and negotiations began August 29. February 14, 1952, the employes voted to strike and notified the company. The strike occurred April 30 and June 21 the employes offered to return to work. The company refused to reinstate them. The employes were not reinstated until after a new contract was executed August 3.

The contract did not contain a no-strike clause, but neither party gave the termination notice provided by it and it remained in effect up to the signing of the new contract.

The issue was whether the union had complied with the "cooling off" provisions of the act, which the company charged it had failed to observe.

Congressional intent cited . . . "Considered both in the framework of industrial reality and in the perspective of the congressional purpose to protect the stability of collective bargaining agreements against strikes and lockouts during the life of the contract, it becomes clear that Congress used the term 'expiration date' to signify the date in the course of a labor contract when the contract, by its own terms, is subject to either modification or termination, regardless of whether notice is required explicitly by the agreement," the board held.

"The term 'expiration date' as used in Section 8(d) (4) thus has a twofold meaning: it connotes not only the terminal date of a bargaining contract, but also an agreed date in the course of its existence when the parties can effect changes in its provisions."

Under this interpretation, in contracts of indefinite duration the 60-day notice to modify or terminate would fix the period during which lockouts and strikes are proscribed.

Alaskan Seeps Found

WASHINGTON.—Large seepages of oil have been discovered at two localities in the Malaspina district of southern Alaska by a reconnaissance party of the U. S. Geological Survey, Interior Secretary Douglas McKay announced this week.

Geologic structures favorable for the entrapment of oil also were found in the vicinity of the seepages, discovered in the course of a study of the petroleum possibilities of the 300-mile long Gulf of Alaska Tertiary province.

The Malaspina district includes a coastal plain of low relief lying between Icy Bay and Yakutat Bay and bordering the foothills of the Saint Elias Mountains.

The area lies just east of the Katalla-Yakataga area where Phillips Petroleum Co. and Kerr-McGee Oil Industries, Inc., now are drilling their second wildcat in a large-scale exploratory program.

A geologic map has been prepared of the Malaspina district and adjoining area and is available for inspection at USGS offices.

FPC Power Doubted

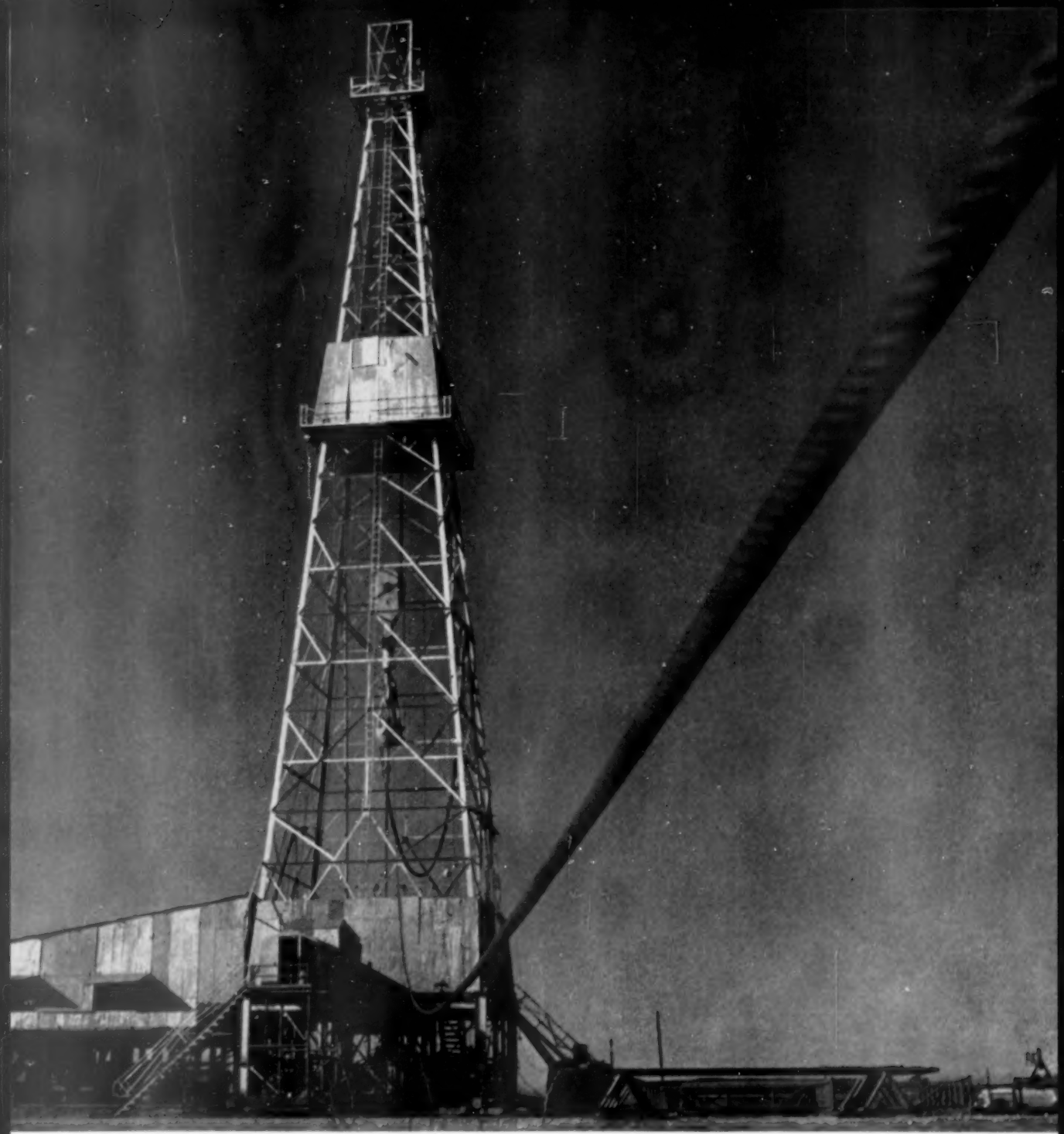
I.P.A.A. attorney says order oversteps court's ruling

WASHINGTON. — The Federal Power Commission is illegally using its newly-won authority in three different instances, an attorney for the Independent Petroleum Association of America charged last week.

L. Dan Jones, I.P.A.A. assistant general counsel, questioned the legality of the commission's acts in several instances, but listed three principal areas of where it has overstepped new au-

Allied Chemical Omaha Plant Produces First Urea

Allied Chemical & Dye Corp.'s ammonia plant at Omaha is producing urea, 4 months after the new plant's ammonia facilities went into operation. Built on what was once farm land at the junction of the Platte and Missouri rivers, the $25 million plant is designed to produce more than 100,000 tons of nitrogen products a year with processes utilizing natural gas as raw material. The urea produced here from ammonia and carbon dioxide will be used as fertilizer and cattle feed supplement.



Wire Rope at Work—This big outfit was photographed in the Wickett Field of West Texas while drilling was going on at approximately 13,000 ft. The well was completed at a total depth of 15,810 ft. Owner of the rig is the Zephyr Drilling Corporation of Tulsa, Okla.

To Bethlehem wire rope were entrusted duties of major importance. Purple Strand Form-Set (preformed) was used as rotary line, and it easily handled the weight of the drill pipe. The "safety-slide" cable, which seems to be shooting right out of the picture, was also a Bethlehem line. Responsible assignments—and here, as always, the Bethlehem ropes met every requirement with plenty to spare.

Bethlehem Steel Company, Bethlehem, Pa. On the Pacific Coast Bethlehem products are sold by Bethlehem Pacific Coast Steel Corporation. *Export Distributor:* Bethlehem Steel Export Corporation

Mill depots and distributors from coast to coast stock Bethlehem rope for the following industries and numerous others:

PETROLEUM • MINING • CONSTRUCTION • EXCAVATING • QUARRYING • LOGGING • MANUFACTURING

thority granted it by the Supreme Court ruling on the Phillips case.

Jones doubts that the commission has the power to govern all interstate natural-gas sales for resale. He said the court ruling specifies the FPC has jurisdiction only over rates of "all wholesales" of natural gas in interstate commerce.

Forcing independent producers and gatherers to obtain certificates to sell gas is "subject to serious question," Jones said. He said the commission's power is limited to only determining just and reasonable rates for gas.

The attorney also challenged the commission's right to make its July 16 order retroactive to June 7. The commission has no authority to make rates retroactive, he said.

Taxpayers Get a Break

WASHINGTON.—Settlement of the Iranian oil dispute will not make Iran immediately self-sustaining, but the agreement will save the American taxpayer some $47 million next year.

Norman S. Paul, Near East regional director for the Foreign Operations Administration, told the House appropriations committee it will cost Uncle Sam only $24 millions for technical equipment and personnel for Iran this year, compared to $71 millions in fiscal 1954.

Paul said a return of Iranian oil to world markets does not mean Iran will be immediately solvent and fully able to support herself because "revenues are not going to be very substantial the first year or perhaps the first 2 or 3 years."

Public Lands Drive Planned

WASHINGTON.—A real drive to turn the oil and mineral-bearing public lands over to the states will be launched in Congress next year.

Legislation providing for the transfer was introduced in Congress recently by Sen. Frank A. Barrett of Wyoming. Barrett had no intent of pushing it this year, but plans to reintroduce the measure in January and hopes to get early committee consideration.

Barrett has been pressing his idea for 10 years, originally as a member of the House. He has never succeeded in getting a bill sent to the floor.

Under the legislation, all present valid claims to oil and minerals on the public lands would be recognized, and lands essential to the production of atomic energy or part of the national forests would be retained by the federal government. The rights to other public lands would be transferred to the states.

WATCHING WASHINGTON

Bertram F. Linz

Tidelands Back Again

Tidelands oil popped back into the news again this month.

Thirteen senators—none Republican—who asked the President last year to define the boundaries between the tidelands and the Continental Shelf, asked Attorney General Herbert Brownell, Jr., what he has done about it.

A California dentist who wants to drill for oil—for a change—asked the District of Columbia federal court to give him title to an area beyond the 3-mile limit off Long Beach.

The group of senators, who opposed the tidelands legislation last year, challenged the grant of 10½ miles in the Gulf of Mexico to Texas and Florida on the ground the State Department had held that no state should be given a water boundary more than 3 miles from low-water mark and warned that international complications might develop if any exceptions were granted. At that time the only comment from the White House was that the President's views had been so clearly stated there was nothing further to say.

The California applicant's claim for a Shelf lease in the Pacific is based on the "right of discovery" which he has asserted over the past 30 years. At one time an application for permission to build a wharf to facilitate drilling was denied on the ground it would be a hazard to shipping. The dentist now says he has invented a boat from which he can drill without a wharf.

Helium Release Talked

The Government's helium-production business may fall into the hands of private industry, but it will more likely be through a management contract than by sale of the plants.

Discontinuance of all Government production-type activities was recommended last May by a survey team analyzing the activities of the Bureau of Mines. Department officials originally leaned toward sale of the plants but dropped that idea, temporarily at least, when it was indicated Congress might want to have a voice in such a disposition.

The department has helium-extraction plants at Amarillo and Exell, Tex.; Shiprock, N. Mex., and Otis, Kans. Demand for the gas, industrial and military, has increased to the point where a $6,000,000 expansion of facilities is under consideration.

Department officials have expressed doubt that industry would be interested in acquiring them. Not only would a considerable investment be required, but it is probable the Government would want to retain its control over helium sales, originally adopted to prevent export of the gas.

On the other hand, operation of the plants under a management contract, as has been done in the case of other facilities such as synthetic rubber, would get the Government out of the business without relinquishing any of its authority over helium.

About-face Expected

Oil and gas research of the Bureau of Mines is expected to be stepped up and cooperation with the industry strengthened as a result of recent studies of the bureau's work.

Those studies showed that the bureau has not been expanded in this field. As a matter of fact, Interior Secretary Douglas McKay was told in a report, "other programs for augmenting oil reserves with production of government-subsidized synthetic liquid fuel have been initiated and expanded on the premise that the country was running out of oil, while research in improving recovery of known reserves of oil was neglected."

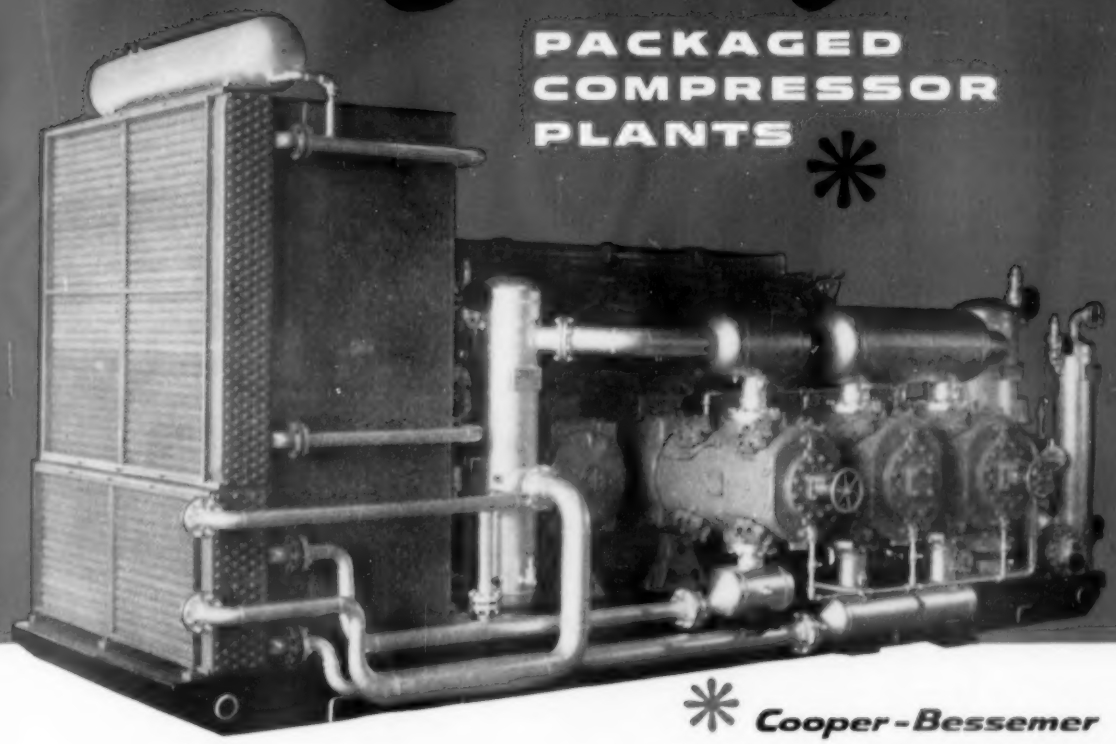
Better liaison with industry would assist the bureau in determining programs of most merit and it was suggested that the number of cooperative agreements with the American Petroleum Institute and other organizations be increased.

Furthermore, the report recommended, bureau technologists should attend the Interstate Oil Compact Commission and other industry meetings, to keep informed on what is going on.

Through its research work and compilation of statistics the bureau is in position to make a very important contribution to industry, McKay was reminded. No reorganization of the bureau should be permitted to impair these services.

Southwest

PACKAGED COMPRESSOR PLANTS *



* Cooper-Bessemer

GMX V-ANGLE GAS ENGINE-DRIVEN COMPRESSOR

Completely Portable

SOUTHWEST Packaged Gas Engine-Driven Compressor plants are complete, portable units. Code constructed and fully factory assembled, they are mounted on portable, heavy-duty skid bases with cooling, air starting, lubricating, scrubbing, and automatic control systems installed and ready for unattended field operation.

Custom Engineered

Every SOUTHWEST plant is individually engineered for present needs and simple conversion to future requirements. The heart of the packaged unit is the compact, Cooper-Bessemer GMX, V-angle gas engine-driven compressor unit, available in sizes to 500 horsepower. Wind direction has no effect on the performance of the specially designed vertical air discharge cooling system. Efficient operation of the cooling unit saves horsepower to be applied to compression of more gas.

FOR GAS LIFT, GAS BOOSTER, PRESSURE MAINTENANCE AND SIMILAR PROJECTS

SOUTHWEST INDUSTRIES, INC.

Post Office Box 7773 Houston 7, Texas

Tanker Bills Signed

Trade-ins approved, Navy gets go-ahead on new ships

WASHINGTON.—The biggest tanker-construction program since World War II days was approved by President Eisenhower last week.

The President signed two measures which he said will help modernize the nation's tanker fleet and give "a much-needed stimulus" to the shipbuilding and associated industries.

One of the measures provides for construction of five large, high-speed tankers by the Government and 15 by private enterprise to be operated under long-term charter by the Military Sea Transportation Service. The other bill permits owners of tankers built during the war to trade them in for government credit allowances to be applied on the construction of new vessels. Under this measure, 20 T-type tankers could be turned in on 10 new ships.

It is estimated the five tankers to be built by the Navy will cost $37,500,000, and the trade-in program will cost $26,000,000,000.

Gas Order Modified

WASHINGTON.—The Federal Power Commission's order regulating natural-gas producers has been modified, but spokesmen for interstate pipeline companies say the change will primarily benefit royalty owners and lease holders rather than producers selling in interstate commerce.

The revision permits producers desiring to engage in new service to file the simplified applications for certificates to sell gas.

The regulations provide that where the established or new service calls for sales of less than 1,000,000 M.c.f. of natural gas in interstate commerce annually, an original and five copies of the abbreviated application must be filed. Where annual sales amount to 1,000,000 M.c.f. or more, an original and 14 copies of a somewhat more detailed application is required.

Applications for certificates covering operations under way June 7 must be filed by October 1.

Aid Offered Policy Group

WASHINGTON.—The oil industry is pushing for its share of representation on any committees that might be named to aid the newly-appointed Cabinet Committee on Energy Supplies and Resources.

The President has ordered the committee to submit recommendations by December 1 for an administration fuel policy. Mobilization Director Arthur Flemming is committee chairman.

Meanwhile, it was reported from Austin that the Texas Independent Producers and Royalty Owners Association will file a petition with the Tariff Commission for relief from excessive imports which it is charged are seriously depressing domestic production.

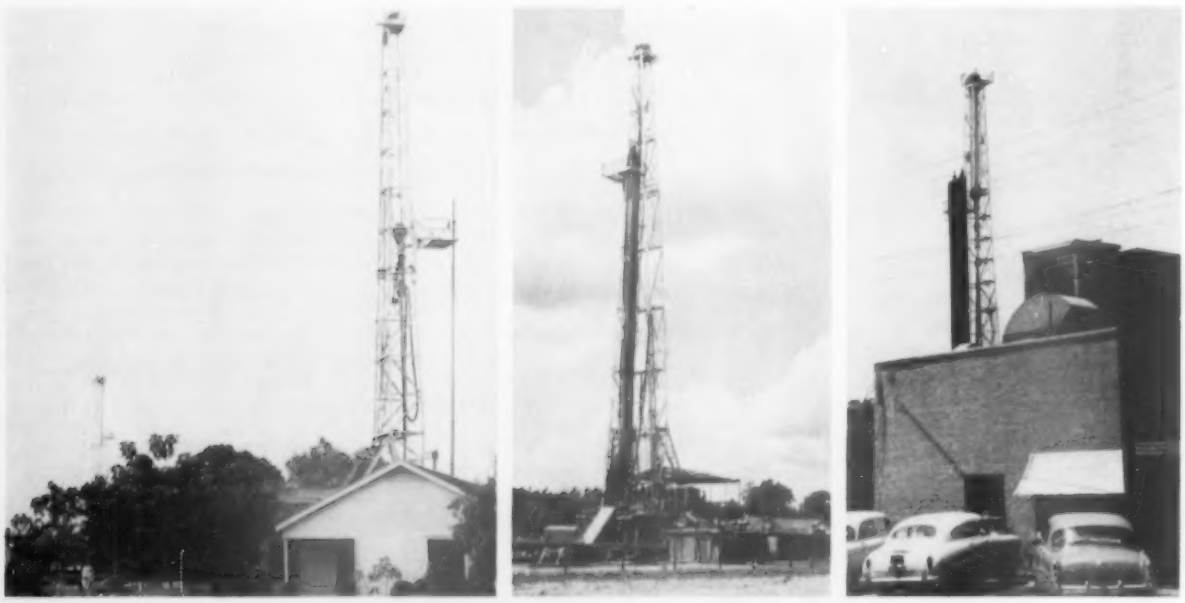
Compensation Rules Set

WASHINGTON.—Oil and gas operators on the Continental Shelf will be made subject to the Longshoremen's and Harbor Workers' Compensation Act by the Department of Labor in September.

Regulations covering the extension of the act to the federally controlled submerged lands have been issued by the department for study by the operators and if no valid objections are raised they will become effective about the first of the month.

Application of the law, which provides for the payment of compensation for disability or death, was provided for in the Submerged Lands Act of 1953.

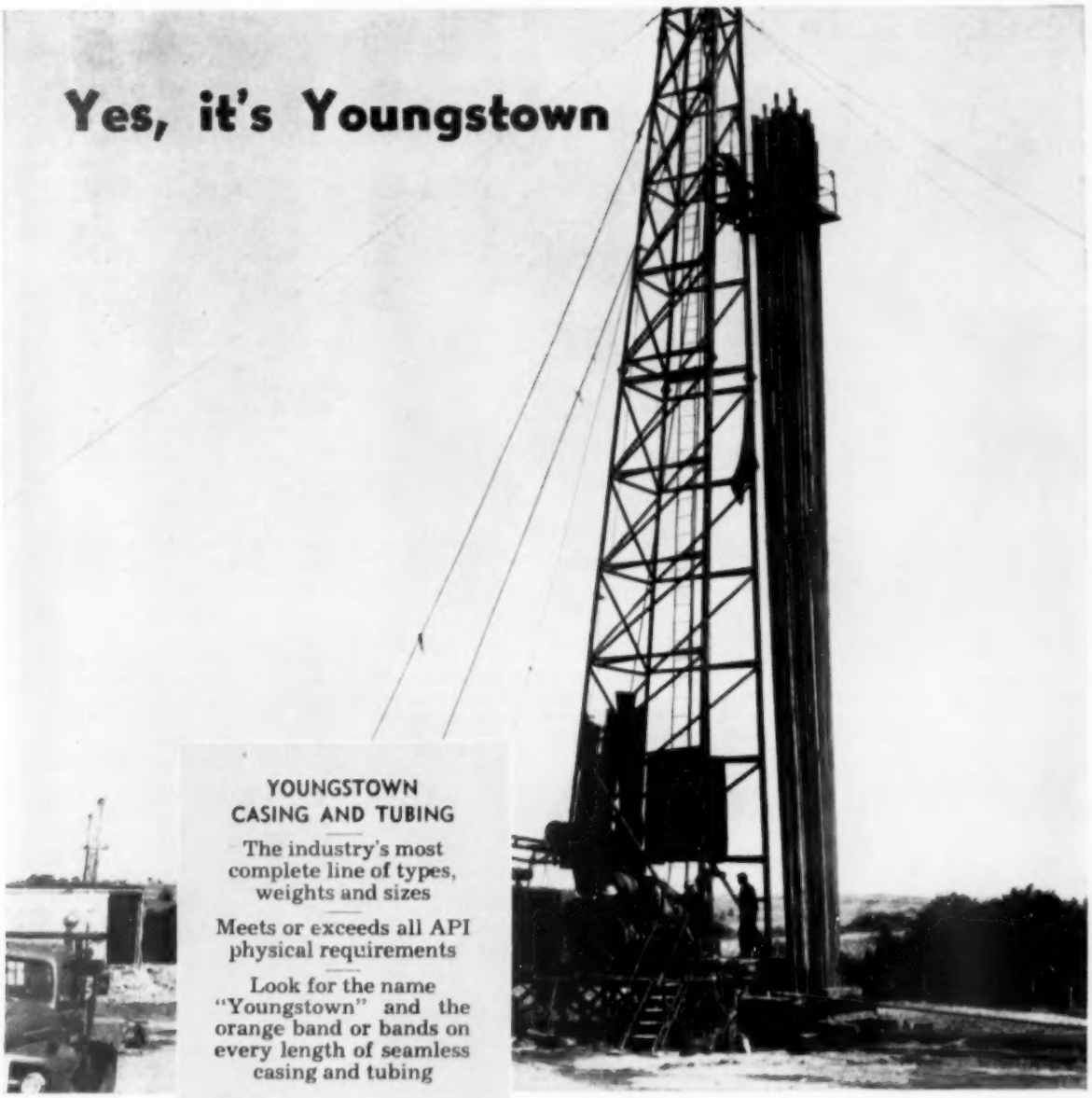
The proposed regulations would cover all employes, except ship crews and government personnel, engaged in "operations conducted on the outer Continental Shelf for the purpose of exploring for, developing, removing or transporting by pipeline the natural resources of the subsoil and sea bed."



Drilling Rigs Invade Texas Gulf Coast Towns of Conroe, Baytown

Gulf Coast exploration is literally "going to town", as townsite drilling moves into the backyards of citizens in Conroe and Baytown, Tex. At left are two C. J. Brown rigs at work in the Harper Addition in the East Baytown development tract. This is a 4,500-ft. flank development on the old Goose Creek salt dome where the first oil well was completed in 1908. In the center is a Roush Drilling Co. rig at work on Humble Oil & Refining Co. 1 Unit 96 inside the Conroe townsite. At right is Morgan, Inc., Unit No. 75 being completed just behind the city bus depot. This is in the newly discovered Conroe Townsite field, producing from Cockfield sands at about 5,400 ft.

Yes, it's Youngstown



YOUNGSTOWN CASING AND TUBING

The industry's most complete line of types, weights and sizes

Meets or exceeds all API physical requirements

Look for the name "Youngstown" and the orange band or bands on every length of seamless casing and tubing

Youngstown

QUALITY V YOUNGSTOWN SERVICE

In thousands of wells from the Gulf to Canada—many on the pump for twenty years and more—Youngstown Tubing is serving dependably. So when you run a string in any well, shallow or deep, you can be sure of performance with Youngstown Seamless Tubing.

THE YOUNGSTOWN SHEET AND TUBE COMPANY

Manufacturers of Carbon, Alloy and Yoloy Steel

GENERAL OFFICES: YOUNGSTOWN, OHIO

EXPORT OFFICE: 500 FIFTH AVENUE, NEW YORK 36, N. Y.

BEFORE the program only evidence of a well's site was capped casing extending a few feet aboveground, as it does here beside John Hillard, Richfield engineer.

AFTER new tubing heads were installed, rods and tubing run, and hydraulic pumping units installed, the 32-year-old Casmalia wells present an entirely different view.

Old Wells Revived

Richfield returns to long-abandoned field in California to produce low-gravity crude for new refining units

D. H. Stormont

SANTA MARIA, Calif.—Abandoned for 28 years, Richifeld Oil Corp.'s Soladino property in the Casmalia area now looks like a prosperous oil field. That's what Richfield thinks it will prove to be.

During the past 10 months new pumping units have been springing up where old timers had practically forgotten wells ever existed. The long-neglected wells are producing about 1,300 bbl. of crude daily, bringing to this area a slight recurrence of the oil fever of more than 30 years ago.

The modern electrically-driven pumps, shiny storage tanks, and new gathering system belie the condition of the newly-revived wells. Below the surface of the ground is old casing planted three decades ago.

Revives 20 wells . . . So far, Richfield has revived 20 of the wells, originally drilled about 1922. Because of its extremely low, 9°-gravity, there was little market for the Casmalia crude in 1925 when the wells were shut in.

Consequently, from 1925 until late last year, the wells sat idle. Only visible evidence of their existence was old ring-type casingheads extending a few feet into the air. All roads had vanished. All surface well equipment and tubing had been junked.

With completion of a large cat cracker at its Los Angeles refinery, Richfield was able to handle more heavy crude and convert it into high-quality products. It spent several hundred thousand dollars to transform its desolate property in the Casmalia field into a model lease.

Richfield officials do not explain why they decided to renew production in the low-gravity pool when other companies are shutting in such reserves. But they confidently predict the project will have a relatively good payout.

Surprisingly, practically all the casing in place was in usable condition. The casing in only one well was so badly corroded as to require replacement. In most cases, caps on the wells were leaking because of the years of exposure to sour well gases.

Little equipment needed . . . In most of the wells equipment requirements consisted of providing new tubing heads and running rods and tubing. Pumping units with a 6-ft. stroke were installed.

When the wells were rejuvenated, Richfield found that fluid levels remained at about sea level regardless of the rate at which they were pumped. This is assumed to be due to the field's aquifer being in communication with the Pacific Ocean, which lies about 6 miles west.

Because of the crude's low gravity, diluents must be used to keep the viscous material fluid after it cools from a wellhead temperature of about 110°F. No down-the-hole injection is used; blending is carried out in the gathering system. Currently a 53°-gravity naphtha is being used, at the rate of approximately 125 bbl. daily.

The crude is shipped through Union Oil Co.'s Santa Maria Valley gathering system to the Avila loading terminal. There Richfield tankers pick it up for movement to the Los Angeles refinery.

Offshore Controls Sought

SANTA BARBARA. — Proposed changes in California's offshore leasing and drilling laws will be discussed here August 27 at a public hearing before the state senate's interim committee on oil and gas development.

Santa Barbara city and county officials are seeking legislation which would permit them to halt any development of submerged lands offshore from the county.

The Western Oil and Gas Association has presented comprehensive proposals intended to modernize and liberalize various provisions of the offshore legislation.

Offshore Election Slated

SANTA MONICA, Calif.—A special election is scheduled November 2 to determine whether drilling will be permitted in Santa Monica Bay, city-owned out to the 3-mile limit. Oil drilling and production are now prohibited within the city.

It is proposed to permit successful bidders to drill from sites erected more than a mile offshore.

The Santa Monica city council has approved a proposed contract which will require the city be paid a bonus of $500,000, plus royalties. In addition, it is proposed that the successful bidder

will pay $250,000 annually 5 years after production has been established. A penalty of $10,000 daily is provided if drilling operations result in beach pollution.

A deadline of September 14 was set for submission of bids by interested companies. The election will determine if the successful bidder is permitted to drill.

Coast Output Drops

California field decline, plus completion of fewer and less productive wells, drops state production this year

LOS ANGELES. — California's daily crude-oil production continues to fall behind the record rates set last year, due principally to the completion of fewer and less productive wells.

Currently the state's fields are producing at the 975,000-bbl. daily level. This is 5,000 bbl. below June, 10,000 bbl. below the May average, 25,000 bbl. under last January, and 41,000 bbl. daily below the all-time peak output of June 1953. It is 25,000 bbl. under last year's average production of 1,000,000 bbl. daily.

Failure to keep pace can be attributed partially to some heavy-oil wells being closed in. Late last year Tide Water Associated Oil Co. shut in 4,000 bbl. of Kern River production because of climbing low-gravity crude inventories. Due principally to Standard Oil Co. of California idling about 6,500 bbl. and Shell Oil Co. shutting in 2,300 bbl., total shut-in heavy-oil production currently is about 15,000 bbl. daily.

Decline in drilling activity during the first half was minor, 1,223 completions as compared with 1,275 in the like period of 1953. The number of wells completed likewise dropped only slightly, 935 to 889 for the 6-month period.

Poorer wells . . . The caliber of this year's oil wells, however, is running about 15 per cent below last year's average. According to California Conservation Committee statistics, last year's average well had an initial production of 114 bbl. daily. For the first half of this year, the average was 99 bbl. daily. During June it dropped to 93 bbl. daily. Aside from 1948, another poor year, this year's crop of wells promises to have the lowest initial production average of the past decade.

Still another factor is that the rate of decline in California fields probably is running higher than in recent years. For the 12-month period July 1952 to July 1953, the Conservation Committee estimated decline at the rate of 1.25 per cent per month, or 14 per cent annually. With output hovering near the 1,000,000-bbl. mark, 140,000 bbl. of new production would have to be added annually just to offset the decline in older fields. Indications are that the monthly rate of decline was even higher, probably close to 1.5 per cent per month, for the first half of the year.

Stocks still climb . . . Despite the production decline, and a 30,000-bbl. reduction in imports from the 80,000-bbl. average for the first half of last year, total petroleum stocks on the West Coast continue to increase. Bureau of Mines figures placed them at 126,920,000 bbl. on May 31. This represented a gain of about 18,000,000 bbl. over the year previous and an increase of 4,000,000 bbl. for the 5-month period. During June and July the upward trend continued, according to A.P.I. estimates, at the rate of about 25,000 bbl. daily.

The gain in stocks can be attributed almost entirely to residual oils, up some 5,000,000 bbl. to approximately 26,800,000 bbl. on July 31. Feeling the affects of a relatively warm winter and continued inroads being made by Texas natural gas, as well as decreased railroad demand, they were more than 7,000,000 bbl. over those at mid-1953.

At the close of May, last month for which Bureau of Mines detailed consumption figures are available, total demand for residuals was trailing last year's daily average by about 25,000 bbl.

Lawsuit Growing

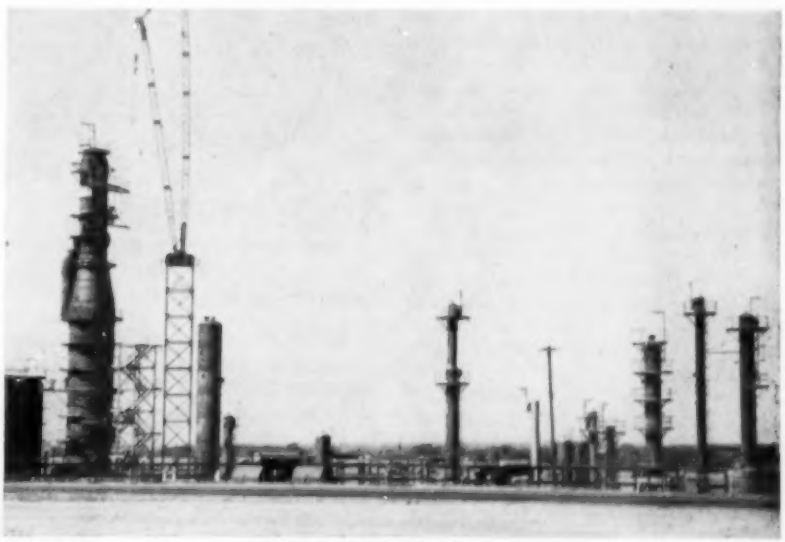
Long Beach taxpayer squabbles over oil income

SAN FRANCISCO.—The suit questioning Long Beach's right to spend tideland oil funds for upland projects has received another rider.

In a brief field early this month before the state Supreme Court, a Long Beach taxpayer complained about 10 appropriations for civic projects he claims are illegal. The suit contends the money can be spent only for harbor improvements according to the terms under which the state granted the lands to the city in 1911.

This is the second such brief filed recently in the Felix Mallon case, started in 1951 as a legal test of the city's right to spend half of the oil funds for upland improvements. The 1951 legislature granted the city permission to do so, on the theory the $150,000,000 fund was not all needed in the harbor area.

Early in July a "friend of the court"



New Cat Cracker Going Up at Kerr-McGee Refinery

Construction of the new 6,000-bbl. daily U.O.P. fluid catalytic cracker is well under way at Kerr-McGee Oil Industries, Inc., refinery at Wynnewood, Okla. The major unit in a $4,500,000 expansion program, the cracker, left, will be accompanied by a gas concentration unit, center, and a polymerization unit at the right. Refinery Engineering Co., Tulsa, is doing the construction.

brief was filed by the Tulare County Farm Bureau. It attacked not only the legality of the proposed expenditures but also the city's right to income from the oil lands. The farm bureau contends the funds properly belong to the people of California rather than to Long Beach citizens alone.

What action the state will take in the controversy has not been decided, Atty. Gen. E. G. Brown said recently. "It will be at least another month or so before we are able to make any decision on whether we will enter the present suit, file our own suit, or stay completely out of the case," he declared. The Supreme Court is expected to rule on the suit next month.

Platformer Added

Montana plant is portion of $43,000,000 project

LOS ANGELES.—Union Oil Co. has completed first phase of a $43,000,000 expansion and modernization program designed to improve the quality of products at its Los Angeles, Oleum, and Cut Bank refineries.

First of the upgrading facilities to go into operation will be the new 600-bbl. Platformer constructed at the company's Cut Bank, Mont., refinery. A new Unifiner of comparable capacity is scheduled to start operation shortly.

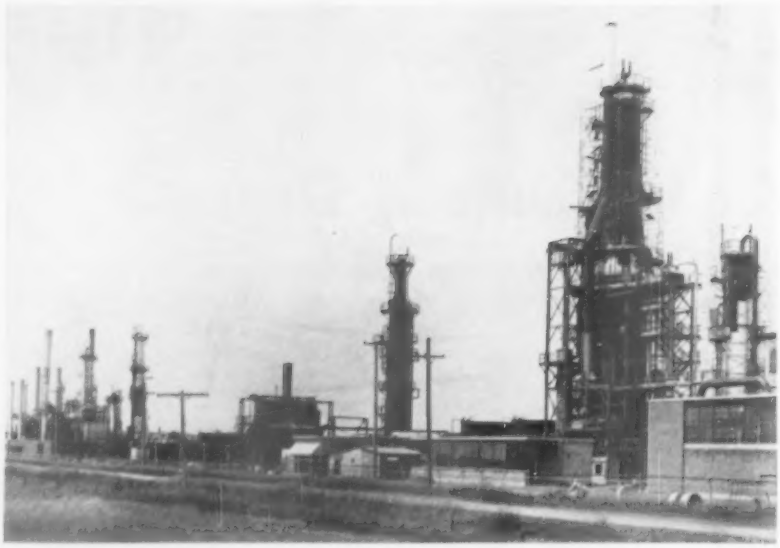
In addition to improvements at the three refineries, the long-range modernization program will include construction of an 18,000-bbl. delayed coking unit and 42-ton capacity sulfur recovery plant near Santa Maria. These are scheduled for completion next March. Gasoline and gas oil recovered from the low-gravity, high-sulfur Santa Maria crude will be shipped to Oleum for further processing.

Oleum activity . . . At Oleum the company is at work on a 14,500-bbl. Platformer and a 15,750-bbl. Unifiner. Excess hydrogen from the Platformer will be used in the Unifiner to upgrade straightrun and cracked gasoline stocks before they are charged to the Platformer. The Platformer and Unifiner are to be completed about January 1.

Field construction will start soon on other new Oleum installations. These will include a Unisol plant for treating cracked gasolines, a 60-ton sulfur recovery unit, and miscellaneous tankage and other equipment. Work already is under way on extensive new wharf facilities at the Oleum refinery.

Los Angeles work . . . Work is nearing completion on the rehabilitation of butane isomerization facilities at Union's Los Angeles refinery. These facilities have been shut down since 1946. Recent increased demand for aviation gasoline and continued increase in octane rating of motor fuels were given as reasons for revamping of the plant. Initial operation is expected about September 1.

At the Los Angeles marine terminal construction also is under way on additions to tankage. About 500,000 bbl. storage is being added for gasoline and stove, diesel, and lube oils.



Consumers' Co-op Boosts Capacity to 12,000 Bbl.

The 6,500-bbl. daily vacuum unit, center, and the 5,000-bbl. daily U.O.P. fluid cat cracker, right, now being completed at the Regina, Sask., refinery of Consumers' Co-operative Refineries, Ltd., will boost the plant's capacity to 12,000 bbl. daily. In addition to the two major units, the refinery modernization program includes construction of a high-pressure gas-concentration unit and a polymerization unit. Auxiliary facilities include new treating equipment, tankage, laboratory facilities, and warehousing. Master control equipment for all the new units is housed in a centrally located control room. Refinery Engineering, Ltd., Toronto and Tulsa, fabricated and erected the new units and converted an existing thermal cracking unit to a crude unit.

SOUTHWEST

Crude Buying Data Asked

AUSTIN. — The Texas Railroad Commission wants to know how much oil crude buyers are obtaining from states other than Texas. Texas hopes to learn if its reduced oil production is being shared proportionately by other states.

Texas crude buyers have been asked to supply the information prior to the August 19 meeting at which the state's September allowable will be set.

Chairman Ernest O. Thompson, in a letter to buyers, pointed out Texas' allowables have been "very low" for several months, but that little progress has been made in reducing the crude surplus and oversupply of stocks. He indicated Texas producers have been suffering more than out-of-state operators.

The commission is particularly interested in how much crude buyers are obtaining from Oklahoma, New Mexico, Louisiana, and Kansas.

CANADA

Pembina Has Jurassic Oil

EDMONTON.—The Pembina region of west central Alberta has indicated oil production from the Jurassic at the Socony-Seaboard-Merrill-Cancoll Violet Grove wildcat about 65 miles southwest of here.

The 7-6 Violet Grove, which is now indicated as a Jurassic oil discovery, is about 1¼ miles east southeast of 12-12 Pembina Cardium sand oil well. The well, which also gave up a substantial gas flow from the same formation, had previously yielded some free oil in the Blairmore formation.

The Socony-Vacuum Oil Co., Inc., team is the discoverer of the first Cardium sand light-gravity crude oil in the Pembina region. *(See Canada field section for complete details of tests).*

Tax Mixup Looms

Louisiana collector plans levy on disputed tidelands

BATON ROUGE.—Louisiana's revenue collector, Rufus Fontenot, is sharpening his pencil, preparing to tax the state's tidelands out to 10.5 miles from the "coast line." But the federal Government may stop him before he collects a penny.

Louisiana, like its neighbor, Texas, is feuding with the Government over who owns the tidelands past 3 miles from shore. The Government claims control of the land past the 3-mile point, but both states claim jurisdiction out to 3 leagues or 10.5 miles.

But, Louisiana has declared its historic boundary is farther out than the Texas boundary. The state legislature has redefined the state's "coast line"—pushing it into the Gulf of Mexico 25 miles in some cases—and then added the 3-league figure *(The Oil and Gas Journal, August 2, page 54)*.

Last week, Fontenot decided the state should collect taxes on the newly-claimed land and notified oil companies of his intentions.

The problem is expected to be settled in October when both the state's mineral board and the Interior Department offer offshore tracts for leasing.

Line Moves First Crude

HOUSTON.—An initial delivery of 42,700 bbl. of crude oil has been made through Cities Service Pipe Line Co.'s new 59-mile, 12-in. pipeline from Houston to Sourlake, Tex.

The line, constructed by O. R. Burden Construction Co., Tulsa, has an initial capacity of 70,000 bbl. The line will move crude from Sourlake to Cities Services' 20-in. line that runs to Cities Service Refining Corp.'s refinery at Lake Charles.

Offshore Bid Deadline Set

AUSTIN.—The General Land Office has set September 7 as the deadline for bids on four tracts of state-owned land in the Gulf of Mexico off Matagorda County.

The tidelands tracts will include: L-374, west half of northeast quarter, 720 acres; L-438, northwest quarter of the northwest quarter, 360 acres; L-439, northeast quarter of the northeast quarter, 360 acres; and S-512, 640 acres.

Crude Line Finished

First deliveries of crude were made last week to Magnolia Petroleum Co.'s Beaumont refinery through a new 208-mile, 20-in. crude line from Corsicana. The line, which is owned by Magnolia Pipe Line Co., transports crude delivered to Corsicana from West Texas, New Mexico, North and East Texas, and Oklahoma. The line has an initial capacity of 120,000 bbl. daily and a design capacity of 165,000 bbl. daily. It will replace a multiple-line system between the two points.

Swamps Drying Up

Roads to replace bayous through marshy oil field

NEW ORLEANS.—Water is becoming so scarce in the swamps of Iberville Parish in southern Louisiana that Shell Oil Co. plans to remove its boats from the White Castle field and replace them with trucks and other land-bound vehicles.

Because the Army Engineers' Atchafalaya-Morganza floodway system has lowered the water in the field's bayous and canals, Shell's production department plans to construct access roads to service its wells.

Although canals frequently are dredged to provide water transportation into swampy fields, Shell believes this may be the first reverse conversion of marine to dry-land operation.

When Shell first moved into the field 26 years ago, water was so high that oxen were the most common means of moving equipment to location.

The Government's $40,000,000 flood-control system, now nearing completion, will divert flood waters from the Mississippi River 25 miles north of Baton Rouge and carry them down the Atchafalaya River to the Gulf of Mexico just below Berwick and Morgan City. It also is intended to ease the diversion of normal flow from the Mississippi into the Atchafalaya at Old River *(The Oil and Gas Journal, January 11, page 60)*.

Shelf Test Planned

Pure to try for production on federal lands off Texas

HOUSTON.—The outer Continental Shelf off Texas is getting set for another deep wildcat test.

This time Pure Oil Co. will seek to establish commercial production on federal tidelands. Stanolind Oil & Gas Co. failed in its initial attempt and has abandoned its wildcat in the same general area at a depth of 14,000 ft. *(The Oil and Gas Journal, August 9, page 69)*.

Associated with Pure for the test, designated A-1, on OCS-0109, Block L-189, 12 miles southeast of Galveston Island, are Ohio Oil Co. and Melben Oil Co. The 1,440-acre lease was acquired several years ago by Ohio and Melben and Pure entered into a participation agreement by which it will be the operator. Water over the drilling site is about 60 ft. deep.

Outside 3 leagues . . . Location of the wildcat will be just outside the 3-league, or 10.35-mile boundary. Pure will use the conventional template-type stationary drilling platform 70 by 106 ft.

There has been only one commercial oil discovery on Texas' tidelands, a well brought in by Standard Oil Co. of Texas 1½ miles off Mustang Island, in state owned waters, off Nueces County.

Oil, Gas Producers Sold

CORPUS CHRISTI. — Penn - Texas Corp. and William L. Moody, III, San Antonio, have purchased 20 producing oil wells and 10 natural-gas wells in the Corpus Christi area to further expand their joint ownership of petroleum properties. F. N. Boykin, Jr., Texas oil man, and associates sold the properties.

Penn-Texas and Moody jointly own 95 other producing oil and gas wells. Ownership of the newly acquired properties is split with Penn-Texas owning 54 per cent and Moody the remainder. P. T. Corp., a Penn-Texas subsidiary, will operate the new properties under the supervision of Moody.

the chain of DEMAND

Anchored to the reputation, facilities and service of Norris.

For over 70 years, W. C. Norris has worked to make this chain stronger—by developing improved materials and manufacturing processes to give you quality oilfield products.

Branch warehouses are heavily stocked and strategically located to strengthen the links of this chain. Whether it's Sucker Rods, Fittings, Well Heads, or other items of pumping equipment you need — DEMAND NORRIS — the dependable link in your buying.

Your SUPPLY STORE IS OUR DISTRIBUTOR

W.C. NORRIS, MANUFACTURER, INC.

TULSA, OKLAHOMA

WEST COAST DISTRIBUTORS:
Swaged Nipples and Bull Plugs
REPUBLIC SUPPLY COMPANY OF CALIFORNIA, Los Angeles
Norris Sucker Rods
HICKEY PIPE & SUPPLY COMPANY, Los Angeles

Since QUALITY NORRIS PRODUCTS 1882

BRANCHES:
HOUSTON, KILGORE, ODESSA, TEXAS;
SALEM, ILLINOIS; CASPER, WYOMING

EXPORT: 30 ROCKEFELLER PLAZA, NEW YORK CITY

MATARIPE REFINERY in Bahia, Brazil. These facilities have recently been doubled in size to 5,000-bbl. daily capacity. The refinery is designed to use indigenous Brazilian crude.

Latin American refining

Capacity Due Expansion

Dahl M. Duff

LATIN American refining capacity is scheduled to rise by nearly 10 per cent with the completion of a number of new projects over the coming year.

By the end of the first quarter of 1955, processing capacity in this part of the world will amount to about 1,916,000 bbl. daily. The number of catalytic cracking plants will be doubled to a total capacity of about 114,000 bbl. daily, and the percentage of catalytic cracking on crude will rise to nearly 6 per cent. Thermal cracking will amount then to 39.6 per cent, against 37.4 per cent at present.

Interestingly enough, of the total 161,000 bbl. daily capacity slated to be added over the next year, 132,000 bbl. daily, or 82 per cent, is in refineries owned by various Latin American governments. When these new projects come into operation, nearly 29 per cent of the refining capacity of Latin America will be government owned. Of the privately owned refining capacity, 1,093,000 bbl. daily, or 74 per cent of the total, is in Venezuela and the Netherlands West Indies.

Eight separate refinery construction projects are expected to be completed and placed in operation during the next year. Three are in Brazil and one each is in Mexico, Colombia, Peru, Chile, and Argentina. Six are government-owned operations. Four consist of completely new refineries, while the remaining four are expansions of existing plants.

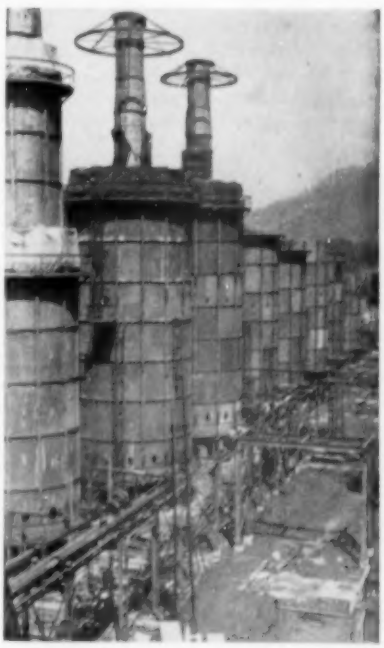
By country, the projects are:

. . . Brazil: Largest of all the projects is the Cubatao refinery of Conselho Nacional do Petroleo, the government organization in Brazil which is being succeeded by the new entity, Petrobras. The refinery, some 5½ years under construction, is located near Santos and is designed to serve primarily the Sao Paulo market. It has 18,000 bbl. daily capacity in reforming and thermal cracking, and another 23,000 bbl. daily in visbreaking. Present information indicates around 25,000 bbl. daily of capacity will be placed in operation soon, with the remainder of the plant coming on stream shortly after the first of the year. Design and engineering was by Hydrocarbon Research, Inc., with construction by Arthur C. McKee & Co.

The Brazilian Government's small existing refinery at Mataripe, which treats the country's only indigenous production, has been doubled in size to 5,000 bbl. daily. This project, by M. W. Kellogg Co., is completed, but startup was delayed by difficulties with the water supply. Some trouble also has been encountered by the government organization with paraffin deposits in the producing wells.

The other project expected to be completed in Brazil this year is the privately owned refinery of Refinaria e Exploracao de Petroleo Uniao, S.A., on the outskirts of Sao Paulo. The contractor, Hydrocarbon Research, expects to have the plant completed by the end of this year. Capacity is 20,000 bbl. daily. Facilities include one of the largest T.C.C. catalytic cracking units with a nominal capacity of 25,000 bbl. daily.

. . . Argentina: At Eva Peron (formerly La Plata) near Buenos Aires, the first unit of a completely new 28,300 bbl. daily refinery of the Argentine Government organization, Yacimientos Petroliferos Fiscales, is expected to be brought into operation around October 1, with remaining facilities on stream by the end of the year. The refinery was designed by M. W. Kellogg Co. and constructed by Y.P.F. under supervision of Kellogg Pan American Corp. Facilities include a 14,430-bbl. (fresh feed) fluid catalytic cracking unit, the first in Argentina, a delayed



PETROCHEM FURNACES under construction at the 45,000-bbl. daily refinery of the Brazilian Government company, Petrobras, at Cubatao. Of the 10 furnaces, two are for crude-oil heating, two for visbreaking, two for naphtha reforming, and four for light and heavy gas oil cracking.

coking unit of 17,794-bbl. daily capacity, and 3,529 bbl. daily in thermal cracking. Nearby is an older Y.P.F. refinery which has a capacity reported at around 70,000 bbl. daily for crude oil. Y.P.F. is understood to be planning to operate the two installations separately with different managers.

...Chile: The first refinery of any size in Chile is nearing completion at Concon, 10 miles north and east of Valparaiso. It will be owned and operated by the Chilean Government oil company, Empresa Nacional del Petroleo. Kellogg did design, engineering, purchasing and supervision of erecting of the process units and some of the other facilities. The refinery will go into operation toward the end of the year. It has 20,000 bbl. daily capacity with about 9,500 bbl. daily in thermal cracking, including visbreaking, and 4,000 bbl. daily in reforming.

...Peru: International Petroleum Co., Ltd., an affiliate of Standard Oil Co. (N. J.), has a new pipe still of 45,000 bbl. daily capacity under construction at its Talara, Peru, refinery. The unit will be placed on stream the latter part of this year. It will provide a net increase of about 9,100 bbl. daily in the refinery's present capacity.

...Colombia: Plans to modernize and expand the Barrancabermeja refinery in the mid-Magdalena Valley of Colombia were made in 1951 when the plant and the De Mares producing property reverted to the government at the expiration of the 30-year concession held by the Tropical Oil Co., a Jersey Standard affiliate. The refinery is being operated under lease by another Jersey affiliate, International Petroleum Co. (Colombia), Ltd.

DELAYED COKING UNIT with a capacity of 17,794 bbl. daily, is included among the facilities of the complete new refinery built for Yacimientos Petroliferos Fiscales near Buenos Aires.

The net increase in crude capacity over present distillation facilities will amount to about 10,300 bbl. daily. Other units include 16,500 bbl. daily visbreaking and 15,130 bbl. daily fluid catalytic cracking. Foster Wheeler Corp., which built the original Barranca refinery, is carrying out the project, along with a number of associated facilities.

...Mexico: Petroleos Mexicanos is carrying out an expansion program at the Atzcapotzalco refinery in Mexico City which is expected to add some 26,000 bbl. daily in crude capacity to this largest of Mexico's processing installations. Capacity will be raised to around 75,000 bbl. daily when the work is completed the latter part of the year.

Crude sources . . . Crude oil for these new Latin American refining projects will consist of both imported and domestic supplies. The Cubatao refinery in Brazil will be supplied under recently awarded contracts for 30,000 bbl. daily of Tia Juana (Venezuela) crude from Esso Export Corp., and 15,000 bbl. daily of Arabian crude from California Transport Corp. Mataripe uses indigenous Brazilian crude, while Gulf Oil Corp. will provide Kuwait oil for the Capuava refinery.

Argentina's new refinery at Eva Peron will treat crude oil from Plaza Huincul and Comodoro Rivadavia, according to a recent Ministry of Industry and Commerce announcement. For the Chilean refinery at Concon, between 8,000 and 12,000 bbl. daily of Oficinia (Venezuela) crude will be provided by Esso, and the remainder from Chilean's own production by ENAP in Magallanes Province. Barrancabermeja uses domestic Colombia crude, principally from De Mares, while the Atzcapotzalco refinery processes Poza Rica oil.

Besides these undertakings, there are several other important refinery projects scheduled later in 1955. Exchange difficulties have recently been cleared for the 10,000-bbl. daily refinery planned at Rio de Janeiro by Refinaria de Manguinhos, S.A., a private Brazilian company. Kellogg did the engineering and procurement. Construction equipment and materials are on the site, and the refinery can be finished the latter part of next year unless there

LATIN AMERICAN REFINING CAPACITY

(In thousands of barrels daily)

	National companies			Private companies			Ttl., natl., private		
	Crude	Thermal cracking	Catalytic cracking	Crude	Thermal cracking	Catalytic cracking	Crude	Thermal cracking	Catalytic cracking
Mexico	243.5	66.5					243.5	66.5	
Trinidad				120.0	32.0	15.0	120.0	32.0	15.0
Cuba				7.7	2.4		7.7	2.4	
N. W. I.				640.0	393.0	37.0	640.0	393.0	37.0
Venezuela				453.0	87.5		453.0	87.5	
Colombia	27.0			7.2			34.2		
Ecuador				5.7			5.7		
Peru	1.2			38.3	3.0		40.5	3.0	
Bolivia	10.9						10.9		
Argentina	105.8	44.0		54.9	26.8		160.7	70.8	
Uruguay	28.0		7.0				28.7		7.0
Brazil	2.5			7.3	2.0		9.8	2.0	
Total	418.9	110.5	7.0	1,334.1	546.7	52.0	1,754.7	657.2	59.0

Expected Additions Through First Quarter 1955

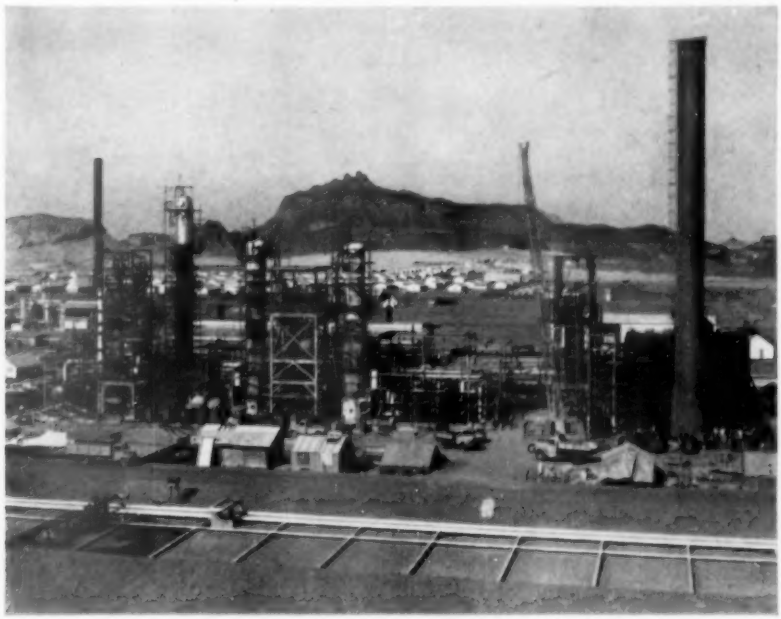
Mexico	26.0	10.0					26.0	10.0	
Colombia	10.3	16.5	15.1				10.3	16.5	15.1
Peru				9.1			9.1		
Chile	20.0	9.5					20.0	9.5	
Argentina	28.3	21.3	14.4				28.3	21.3	14.4
Brazil	47.5	41.0		20.0		25.0	67.5	41.0	25.0
Total	132.1	98.3	29.5	29.1		25.0	161.2	98.3	54.5
Grand total	551.0	208.8	36.5	1,363.2	546.7	77.0	1,915.9	755.5	113.5

are further troubles obtaining the necessary foreign currency.

Some preliminary work has been done for a 5,000-bbl. daily refinery at Manaos on the Amazon. Southwestern Engineering Co. has the contract from the private Brazilian company involved.

Creole Petroleum Corp. has work under way on a project to double the size of its refinery at Amuay in western Venezuela to 120,000 bbl. daily. Completion is expected by the end of 1955. Foster Wheeler has the contract.

A new 10,000-bbl. daily refinery in Puerto Rica being built for Caribbean Refining Co. by Fluor Corp. is due to be completed next year. Pemex has let a contract to Fluor for a new 40,000-bbl. daily crude unit, T.C.C. catalytic cracking, and other facilities, at its Minatitlan refinery in southern Mexico. Several other refinery projects are under study by Pemex.



Aden Goes on Stream

Industry's largest completely new refinery project pushes Anglo-Iranian capacity near point before Abadan loss

REFINING capacity of Anglo-Iranian Oil Co., Ltd., has been given another major boost with the start of initial operations at its brand-new 120,000-bbl. daily Aden plant on the southern tip of the Arabian peninsula.

The project has been the largest completely new refinery job in the industry. The cost of transforming a sandy stretch of desert 6 miles across the bay from the Port of Aden into important oil processing center, complete with housing, port, and other necessary auxiliary installations came to around $150,000,000.

Although Anglo-Iranian had a new Indian Ocean refinery in its program in 1950, the project was pushed ahead after the company lost the 500,000-bbl. daily Abadan refinery in the Iranian nationalization. Aden brings the company's refining capacity to nearly 600,000 bbl. daily, all outside Iran. Just prior to the nationalization, its refining throughput, aside from Iran, amounted to only about 280,000 bbl. daily.

The location of the new refinery is particularly advantageous in that Aden is a British colony in one of the world's most important ships' bunkering stations. The new refinery will produce 58,330 bbl. per calendar day of marine bunker oils. About 40,000 bbl. daily will be moved from the refinery to the bunkering installation through two 19-mile pipelines.

The new refinery went into production 4 months ahead of schedule. Work on the project began in November 1952 with the main contract given into a group consisting of Middle East Bechtel Corp. and George Wimpey & Co., Ltd. At the peak of construction early this year, the work force numbered 14,000 men.

The refinery will operate on crude from Kuwait. Each of the two distillation units has a capacity of 60,000 bbl. per stream day. One feature of these units is that they are the first in the industry to be electronically controlled. An SO_2 unit, now completed, has a capacity of 8,150 bbl. daily. Plants still to be finished are the 3,000-bbl. daily Autofiner, which uses Anglo-Iranian developed process for kerosine desulfurization, and a 12,000-bbl. daily Platformer.

The permanent refinery power station will generate 22,500 kw. and the adjacent oil port, now nearly completed, provides berth for four tankers of up to 32,000-ton size. A large number of housing units have been prefabricated in the United Kingdom for erection near the refinery.

International Briefs

First plant to be built in Britain for the production of isopentane, an aviation gasoline component, is now under construction at the Stanlow refinery in Cheshire of Shell Refining & Marketing Co., Ltd. The unit is being built by Head Wrightson, Ltd., and is due for completion early next year.

Peruvian Pacific Petroleum Co. (Cities Service and Richfield) has abandoned its second well in northeastern Peru, Tablazo 10-1, at 5,660 ft. after a small gas show. The rig has been moved to a new location to the east. The company's first test in this area was abandoned at 5,562 ft.

A new West German oil discovery has been made in the exploratory well, Bramstedt 3A, drilled between Elmshorn and Bad Bramstedt in Schleswig-Holstein by Deutsche Erdoel-A.G., on behalf of the D.E.A.-Preussag-Vacuum partnership. Flow tests at a depth of 6,540 ft. indicated a production of about 300 bbl. daily through a ⅛-in. choke. The discovery was made in the third deep well drilled by D.E.A. in the area.

Anglo-Iranian Oil Co., Ltd., has organized a new subsidiary, Dubai Marine Areas, Ltd., to take over the offshore exploratory concession held by the company in the Trucial Coast shaikhdom of Dubai. An active marine exploration program is under way in the concession which comprises the offshore area beyond the territorial waters.

POLLUTION CONTROL . . . A SYMPOSIUM

THE refining industry is spending many millions of dollars to keep waste streams free of oil, solids, and soluble contaminants. The trend on the part of pollution-control agencies is fully expected to become more stringent. This symposium comprising parts of three papers presented at the nineteenth midyear meeting of the A.P.I. Division of Refining, May 12, outlines three important functions which refiners are studying today.

Many refiners need to take stock of their pollution-control systems by making over-all refinery surveys and an example of such a survey is presented in the first paper. The primary treating consists of removal of oil and sludge as distinct from secondary waste treatment for undesirable solutes. The second paper concerns this primary step, with attention to the possibilities which exist for realizing some material returns from an operation which is generally considered as having no economic justification. New problems have arisen in treating refinery waste to reduce biological oxygen demand and to control effluent pH. One method employs chemical flocculation, which is discussed in the third paper of this series.

—**George Weber, Refining Editor**

How to plan and execute a

1. Refinery Waste-Stream Survey

by A. P. Dennis, Jr.

A waste-stream survey conducted by the Bayway refinery of Esso Standard Oil Co. indicates that the conduct of an over-all evaluation of a total waste effluent and its major component flows is the most practical method of determining the relation and effects of the different sources of contaminants.

Such data are of use in the scheduling of effluent-improvement projects; the continuation of routine sampling of the total effluent provides additional data which can be used to determine if there is any major change in total effluent quality after the period of the over-all survey.

Bayway setup . . . The Bayway refinery is located in the metropolitan section of northern New Jersey. The refinery uses for normal process and cooling purposes from 200,000,000 to 300,000,000 gal. per day of salt water from the Arthur Kill, a tidal adjunct of the New York Harbor. This salt water is used on a once-through basis, and then is returned via a natural-flowing creek in the refinery property to the waterway from whence the flow originated.

Fresh water for potable and process purposes is obtained partly from a local water company, and the remainder is withdrawn from a reservoir located within the refinery property. Approximately 3,000,000 gal. per day of fresh water is discharged to the refinery sewer systems along with the salt water.

Author associated with Esso Standard Oil Co., Linden, N. J.

Planning the Survey

The initial review of the extent of work required to evaluate the quality of the refinery effluent disclosed that the sampling of the refinery effluent would provide insufficient data to determine the reason for unsatisfactory quality of the effluent.

It readily was discernible that it would be necessary to determine the origin, the concentration, and the volume of the contaminants as they were released to the refinery sewer system. These data then could be related to the contaminants in the total effluent.

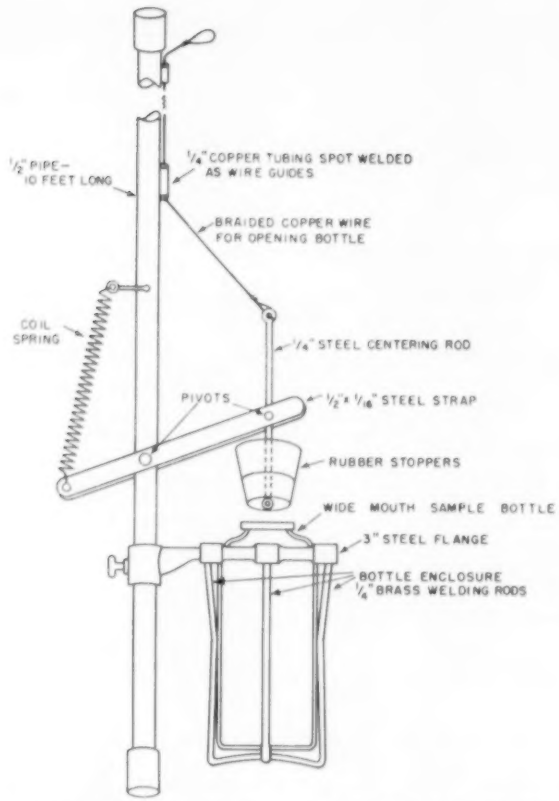
Therefore, the accomplishment of an effluent-evaluation survey required the collection and analysis of a large number of waste-stream samples. These samples had to be analyzed using acceptable procedures for the quality of industrial-waste effluents.

The laboratory division of the technical department was assigned the responsibility of providing personnel for sample collection and analysis. A chemist was assigned to coordinate these activities. His functions included the determination of, and assembly of, adequate sampling and analytical equipment.

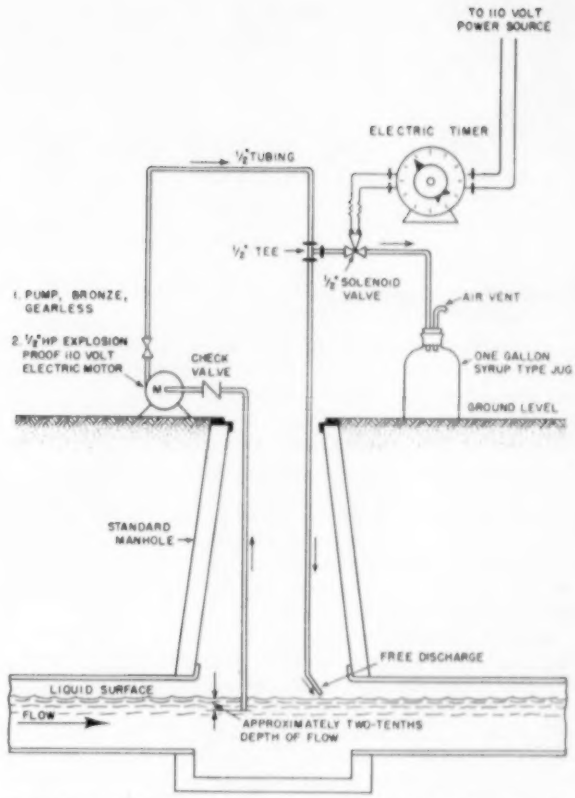
It was recognized early in the setting up of the survey that the reliability of the data would depend primarily on good sampling procedures inasmuch as the analytical procedures to be used were standardized. The use of qualified personnel to take samples—and to make observations of condition of flow when they were obtained—was, therefore, a prime necessity.

From an analysis of the duties of the personnel collecting the samples, and a comparison of the job-description summaries for refinery personnel, it was found that laboratory technicians would be best qualified to perform these duties.

Preliminary estimate . . . A preliminary estimate was prepared at this time of the number of locations in the refinery which would have to be sampled. The size of the refinery precluded the taking of sufficient samples at any one time to determine the origin, the original


½" PIPE— 10 FEET LONG
¼" COPPER TUBING SPOT WELDED AS WIRE GUIDES
BRAIDED COPPER WIRE FOR OPENING BOTTLE
COIL SPRING
¼" STEEL CENTERING ROD
PIVOTS
½" x 1/16" STEEL STRAP
RUBBER STOPPERS
WIDE MOUTH SAMPLE BOTTLE
3" STEEL FLANGE
BOTTLE ENCLOSURE ¼" BRASS WELDING RODS

GRAB SAMPLER for use where depth of flow is greater than 15 in. Fig. 1.



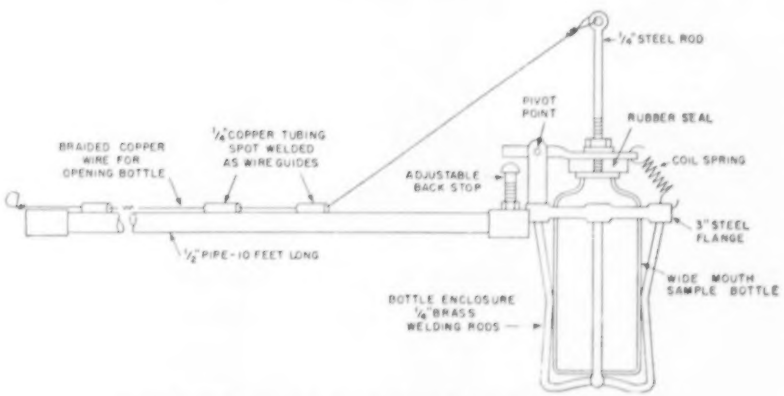
TYPICAL AUTOMATIC compositing sampler installation. Fig. 3.

Pollution Control

concentration, and the volume of each of the major contaminants in the total effluent.

The review of the refinery sewer map indicated that it would be practical to sample sections of the sewer system based on the major branches in the system. There are six major branches to the refinery sewer system; three of the branches handle process waste water and terminate in gravity-type oil-water separators which, in turn, discharge to the creek. The other three are condenser-water sewers which discharge to the creek without the benefit of separators.

Based on the use of two sampling men per shift, it was found that 16 to 18 individual sampling points could be sampled within an 8-hour shift. In some surveys this number of sampling points could be covered twice within an 8-hour shift, whereas in other surveys, because of the distances involved, this number of points could be covered only once per shift.


¼" STEEL ROD
PIVOT POINT
RUBBER SEAL
BRAIDED COPPER WIRE FOR OPENING BOTTLE
¼" COPPER TUBING SPOT WELDED AS WIRE GUIDES
ADJUSTABLE BACK STOP
COIL SPRING
3" STEEL FLANGE
½" PIPE - 10 FEET LONG
WIDE MOUTH SAMPLE BOTTLE
BOTTLE ENCLOSURE ¼" BRASS WELDING RODS

GRAB SAMPLER used when depth of flow is 6 to 15 in. Fig. 2.

Analytical procedures . . . Analytical tests to be used were selected after a careful review of current refinery procedures, procedures of the A.P.I., and information from other petroleum companies. In order to determine the origin and original concentration of contaminants within the refinery sewer system and the refinery effluent, one or more of the tests listed in Table 1 were carried out.

Temperatures were taken using a laboratory-type thermometer, whereas flow measurements were made with a current meter of the type frequently used to determine flow velocities in rivers.

Sampling equipment . . . Equipment for obtaining manual-grab-type and automatically composited samples was developed for use in the survey. The samplers used are shown in Figs. 1, 2, and 3. The analysis and the depth of the water flow determine the type of grab sampling equipment used.

The deep-stream sampler (Fig. 1) was designed to be used where the water flow is greater than 15 in. deep. The holder for the sample bottle is attached so that the open end will be up when the handle is vertical. The length of the handle can be increased,

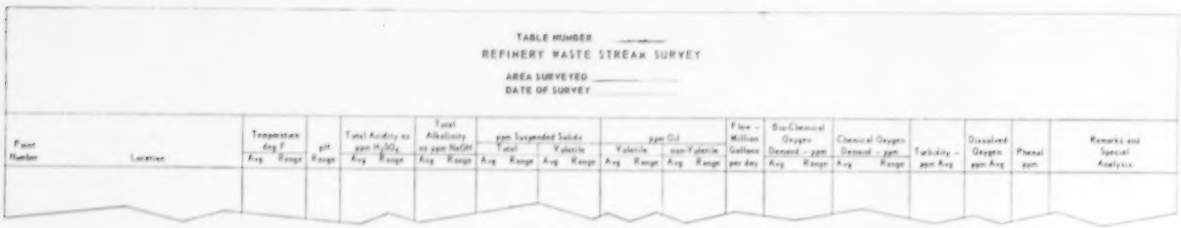


TABLE NUMBER
REFINERY WASTE STREAM SURVEY
AREA SURVEYED
DATE OF SURVEY

Point Number	Location	Temperature deg F Avg	Temperature deg F Range	pH Range	Total Acidity as ppm H_2SO_4 Avg	Total Acidity as ppm H_2SO_4 Range	Total Alkalinity as ppm NaOH Avg	Total Alkalinity as ppm NaOH Range	ppm Suspended Solids Total Avg	ppm Suspended Solids Total Range	ppm Suspended Solids Volatile Avg	ppm Suspended Solids Volatile Range	ppm Oil Volatile Avg	ppm Oil Volatile Range	ppm Oil non-Volatile Avg	ppm Oil non-Volatile Range	Flow – Million Gallons per day	Bio-Chemical Oxygen Demand – ppm Avg	Bio-Chemical Oxygen Demand – ppm Range	Chemical Oxygen Demand – ppm Avg	Chemical Oxygen Demand – ppm Range	Turbidity – ppm Avg	Dissolved Oxygen ppm Avg	Phenol ppm	Remarks and Special Analyses

SAMPLE SURVEY DATA are assembled using this table. Fig. 4.

Pollution Control

to sample deep manholes, by the addition of pipe sections.

The shallow-stream sampler (Fig. 2) was designed to be used where the water flow is between 6 and 15 in. deep. The construction is similar to the deep-stream sampler except for two details. The bottle holder is affixed so that it is horizontal when the sample handle is vertical, and a rubber seal is used for a bottle closure in lieu of the rubber stopper on the centering rod.

Samples for dissolved-oxygen and 5-day biochemical-oxygen demand were collected using samplers as designated in the analytical procedures.

The automatic compositing samplers were constructed and installed as shown in Fig. 3. The pump withdrew at the rate of 6 g.p.m. from below the surface of the stream being sampled. The flow was discharged downstream from where the suction was located. The solenoid valve—installed on a branch from a **T** in the discharge line with the minimum distance possible between the valves and the **T**—normally remained closed. Aliquots of the discharge stream were collected at desired intervals—consistent with the sample volume required—through the frequency of the periods the solenoid valve was opened by the timer cycle.

There are two principal advantages to this type of intermittent sampling as compared to withdrawal of a continuous, reduced flow stream, viz: (1) minimized plugging problems from solids because the solenoid valve opens fully against the 150-psig.-shutoff pump pressure; and (2) assurance of a representative sample of the pump discharge stream because the solenoid-valve opening and the pump discharge line are the same size.

Execution of Survey

The areas within the refinery sewer system were determined to require sampling over one continuous period of 72 hours to provide data which would represent a norm. Then from data analysis it could be determined if additional sampling would be required to provide more comprehensive data for particular contaminants.

TABLE 1—ANALYTICAL PROCEDURES

Determination	Reference
1. Total oil	A.P.I. method 731
a. Volatile oil	
b. Non-volatile oil	
2. Acidity and alkalinity	A.P.I. method 706*
3. pH	A.P.I. method 707
4. Suspended solids	A.P.I. method 709
a. Total	
b. Volatile	
5. Sulfides and mercaptans	A.P.I. method 713
6. Phenols	A.P.I. method 715
7. Turbidity	A.P.I. method 719
8. Dissolved oxygen	A.P.I. method 723
9. Biochemical-oxygen demand	A.P.I. method 727
10. Chemical-oxygen demand	A.P.I. method 728

* Method is under consideration, but has not been published.

The total refinery effluent and its principal component streams, because of their greater importance, were deemed to require 2 sampling periods of 96 hours each in order for data to represent a norm in operations.

The sampling of certain known contaminant sources was undertaken in special sampling periods. Sources in the special category included water drawoffs in working and storage tank fields, the influent water to the refinery, distillate water drawoff from catalytic-cracking-unit distillate drums, and water-treating-plant blowdown sludge.

TABLE 2—UNIT OPERATING DATA DURING SAMPLING SURVEY

1. Unit feed rate — Normal—? Present—?
2. Salt-water consumption: — Normal—? Present—?
3. Fresh-water consumption: — Normal—? Present—?
4. Known contaminants and any information on concentration, period, and/or frequency of release, and whether any contemplated changes in operations would eliminate or change the release of contaminants—?

Preliminary sampling . . . Prior to the initiation of sampling in any given area the project coordinator contacted the senior supervisor in the area to explain the reason for the waste-stream survey. Although the survey already had been announced in a formal management bulletin, the methods of sample collection and analysis, and the intended use of the data for effluent evaluation, required a more detailed explanation.

TABLE 3 — Schedule of Sampling and

Sample point No.	Location	Sampling team determinations: Flow	Temp., °F.	Titration—acidity or alkalinity	pH	Sulfides and mercaptans	Automatically composited samples
1	Unit A		x	100 ml.	x		
2	Unit B	x	x	100 ml.	x		
3	Unit C	x	x	100 ml.	x		
4	Area 1 effluent (Combined flow of Units A, B, and C)	x	x	100 ml.	x	25 ml. per shift composited	x
Totals per shift	15 Sampling points per shift	5	15 readings	15—100 ml. spots	15	4—25 ml. composites	5
Totals for 24 hours		15 15	45—spot samples	45—spot samples	45—spot samples	4—24-hr. composite samples	15—8-hr. composite samples

*23 gal.—oil; 3 qt. suspended solids and turbidity (S & T); 14 pt.—Suspended solids and prepared in laboratory); 15—300 ml.—dissolved oxygen (DO); 4 pt. sulfides and mercaptans;

Particular steps were taken to explain that this survey was not a cost or loss-control survey.

A request was made that this information be passed to the level of unit operators so that they would understand clearly the reason that the sampling survey was being made. If they did not understand clearly the reason for the survey, there could be possibly some tendency on the part of unit operators to change operations or not to make drawoffs or other releases of contaminants during the sampling period. The net result of the changes in operation or delays in discharge of contaminants would be data which would not represent a norm for that particular area.

At the time of this visit, information on unit operating conditions was requested. The data requested are summarized in Table 2.

A preliminary sampling survey was then made of the area.

This served to acquaint sampling personnel with the locations to be sampled, particularly so because it would be necessary to find sampling points at night. It also permitted the determination of approximate concentrations of contaminants which might be expected. Locations also were determined for automatic compositing sampling equipment so temporary power connections could be made by the mechanical department.

After the preliminary survey a chart was prepared listing all points which were to be sampled. Then alongside each point there were checked the analyses to be carried out on samples from that sampling point. This permitted determination of the number and type of samples required. Table 3 shows a sampling and analytical work-load chart for a survey of the refinery effluent and the major component streams. This chart illustrates the method used in the determination of personnel requirements to carry out a sampling survey of a section of the refinery waste stream.

The work-load chart (Table 3) also was used to assemble sample bottles, to prepare laboratory reagents, and to prepare tags for sample identification. This work was carried out prior to initiation of the sampling survey. It is extremely important that the laboratory analytical work load be in balance, otherwise samples will not be analyzed within the required time after they are obtained. In the case of certain analyses, such as dissolved-oxygen and biochemical-oxygen demand, analysis must start immediately.

Unit operating data . . . While the laboratory personnel were arranging for the sampling, the project coordinator and his assistant were obtaining process flow plans for units in the area to be sampled, in determining the location of the meters on water lines to the various units, and in collecting available information on characteristics of wastewater discharge. This latter item included review of test work on units and previous studies of unit operating problems.

In making a determination of the amount of water consumed at a unit, a frequent problem which had to be resolved was the determination of the amount of water discharged to each sewer system when only the total influent water to the unit was metered. It is the custom at processing units to discharge to the process-water sewer system only those flows containing oil or contaminants whereas condenser or cooling water—which normally would not contain oil except in the failure of a tube bundle—is discharged directly to the condenser-water sewer system.

When the quantity of flow discharged to the sewer from a unit could not be determined from an influent water meter, it was necessary to determine the grade of the sewer and the depth of flow at the time of sampling. By use of these facts it was possible to determine from hydraulic flow charts,[2] and from appropriate charts for pipe sections flowing partly full, the quantity of flow at a particular sampling point.

Field sampling . . . Prior to the sampling of an area a list of all points to be sampled was prepared and entered into a master data book. This list was set up with columns for all data to be collected by the field sampling team. These data included temperature and flow measurements in the field as well as observation of unusual conditions.

The field sampling team made either one or two complete rounds of the

Analytical Work Load for Total Effluent and Major Component Sewer Streams

Area Surveyed—Refinery Effluent Stream

Samples analyzed by laboratory personnel						Bottle requirements for sample collection	Requirements for sample assembly in lab., 24-hour basis
Oil	Phenols	Solids and turbidity	Bio chemical oxygen demand	Dissolved oxygen	Chemical oxygen demand		
500 ml. per shift composited		200 ml. per shift composited	300 ml. per shift	300 ml. per shift	200 ml. per shift composited	1 qt.—1 DO 1 B.O.D.	1 gal.—oil 1 pt.—S & T 1 qt.—COD
500 ml. per shift composited		200 ml. per shift composited	300 ml. per shift		200 ml. per shift composited	1 qt. 1 B.O.D.	1 gal.—oil 1 pt.—S & T 1 qt.—COD
500 ml. per shift composited		200 ml. per shift composited	300 ml. per shift		200 ml. per shift composited	1 qt. 1 B.O.D.	1 gal.—oil 1 pt.—S & T 1 qt.—COD
1 gal. per shift	100 ml. per shift composited	200 ml. per shift composited	300 ml. per shift		200 ml. per shift composited	1 qt. 1 B.O.D. 1 gal.	3 gal.—oil 2 pt.—phenol, S&T 1 qt.—COD
8—500 ml. composites 5—1 gal. samples	4—100 ml. composites	14—200 ml. composites 1—1-qt. spot	9—300 ml. spots	5-300 ml. spots	9-200 ml. composites	5 gal. 16 qt. 9 B.O.D. 5 DO per Round	
8—24-hour composite samples 15—8-hour composite samples	4—24-hour composite samples	4—24-hour composite samples 3—spot samples	27—spot samples	15—spot samples	9—24 hour composite samples		Total requirements for laboratory sample assembly*

turbidity (S & T); 9 qt.—chemical oxygen demanded (COD); 81—bio-chemical oxygen demand (B.O.D.) (three dilutions each of 27 samples 4 pt. phenols.

sampling points per shift. It was the custom for the project coordinator or his assistant to accompany them on the initial round of sampling in each area. This was done to pick up any conditions which may have been different from those encountered during the preliminary survey of the area currently being sampled. This close coordination was considered necessary to eliminate all possible factors which could discount the validity of data from sampling.

On completion of each sampling round the field sampling team prepared the necessary composite samples and tagged the spot samples which were to be analyzed by personnel in the laboratory. The schedule for collection of composite and spot samples was set at the time the chart for sampling and analytical work load (Table 3) was prepared for the particular area being sampled.

The field sampling team, on their return to the laboratory after each sampling round, made the necessary titrations for acidity or alkalinity, determined the pH, and prepared the composite samples for analysis for sulfides and mercaptans—all in accordance with the work-load chart. The results of these determinations were entered in the appropriate location in the master data book.

During the progress of each survey constant contact was maintained with process operating personnel of units which discharged flow to the sewer system being sampled. This contact was made in order to be aware of any unusual conditions. The accounting department furnished information on unit feed rates and water-consumption rates on the days the survey was in progress in each area.

Assembly of survey data . . . As the analyses were completed, the data were transmitted to the laboratory coordinator who had them entered in a master data book which had been prepared prior to the survey. As soon as the data were completely assembled, the project and laboratory coordinator reviewed them to determine (1) if the data were complete enough to indicate the type and concentration of contaminants anticipated in a particular stream; and (2) if any conditions had been found which would indicate concentrations vastly different from the preliminary survey.

As soon as the average and range of concentrations of each contaminant had been tabulated in the form indicated in Fig. 4, a meeting was held with the supervisors of the major processing units discharging into the particular sewer system.

At this time the supervisors were informed of the contaminants coming from their areas. The supervisors' assistance was requested in the determination of whether this concentration and flow to the sewer system represented normal operating conditions. The information obtained was then recorded for consideration at the time that each individual sewer system and its contaminant load was weighted against the contaminant load in the total effluent.

Sampling at origin . . . In the selection of sampling points and in arranging the order of sampling, the individual surveys were all laid out on the basis of the sampling's being initiated at the start of the sewer system or at the first unit with a substantial flow. Each major processing unit's flow was sampled before its discharge into the sewer. The final effluent flow from a given group of process units was sampled in order to compare the contaminants there to the contaminants in the individual flows.

By this method it was possible to determine—by a simple material balance—whether any major contaminant sources had been missed. The automatic compositing sampler was another means of determining whether any major contaminant discharges had taken place between the times the grab samples were obtained. However, the automatic sampler does not give realistic data on alternate releases of acidity and alkalinity because of the neutralization which takes place.

REFERENCES

1. Manual on Disposal of Refinery Wastes, Vol. IV: "Sampling and Analysis of Waste Water," A.P.I., New York (1953).
2. Elwyn E. Seelye, Data Book for Civil Engineers, Vol. I: "Design," 2nd edn. 5-30, 5-31, John Wiley & Sons, Inc., New York (1951).

POLLUTION-CONTROL SYMPOSIUM

2. Oil and Sludge Removal At Skelly's El Dorado Plant

. . . aided by segregation of wastes

by W. L. Pursell and T. W. Ferguson

REFINERY primary waste-treating facilities, consisting of oil and sludge-removal equipment, constitute a process separate and distinct from secondary waste-treating facilities which remove undesirable solutes from waste water.

These various pieces of equipment are required to remove oil and sludge from the waste effluent. The water which leaves these facilities is ready for further treatment in order to remove undesirable solutes and to reduce the biological oxygen demand (BOD).

A block flow diagram showing the extent of waste-handling and treating equipment generally required to produce a properly treated waste effluent is shown in Fig. 1. Solid lines outline the equipment recently put into operation at Skelly's plant.

Keeping emulsions, sediment, and sanitary sewage out of a gravity-type separator is a prerequisite for first-class separator operation. It is also essential to hold to a minimum the volume of waste to be treated. Fig. 1 shows the refinery wastes to be segregated into the following five streams so as to facilitate separator operation and other waste-handling processes:

1. Surface water, i.e., storm runoff.
2. Oil sewer: currently carries process water.
3. Sanitary sewer.
4. Water-conditioning sludges.
5. Cooling-tower flush.

The hay filters shown in Fig. 1 constitute temporary installations. These filters are not operated when the separator effluent is given further treatment before its disposal.

Design of Oil-Water Separator

Current refinery waste-water effluent amounts to about 1,500 g.p.m.—not including sanitary sewage. This is the normal volume of water subject to oil removal and secondary treatment. A rainfall of about 2 in. per hour can increase this volume to about 101,000 g.p.m., with about 3,000 g.p.m. flowing in the oil sewer as process water.

To take care of excess water during

Authors are associated with Skelly Oil Co., El Dorado, Kans.

rainfall, an earthen basin with capacity of approximately 17 million gallons was constructed.

This amounts to more than all the runoff water from a 5-in. rainfall. The capacity of the oil-water separator was arbitrarily set at 15,000 g.p.m., so that the basin may be emptied in 24 hours by pumping through the separator at a rate which does not exceed separator rating.

The normal waste water handled by the oil-water separator has the following inspections:

1. Temperature at separation, °F.	80
2. Specific gravity at 80°F.	1.0010
3. Absolute viscosity at 80°F., poises	0.0092
4. Absolute viscosity at 100°F., poises	0.0074
5. Kinematic viscosity at 80°F., sq. ft. per sec.	0.00000989
6. Specific gravity of oil at 80°F.	0.8762

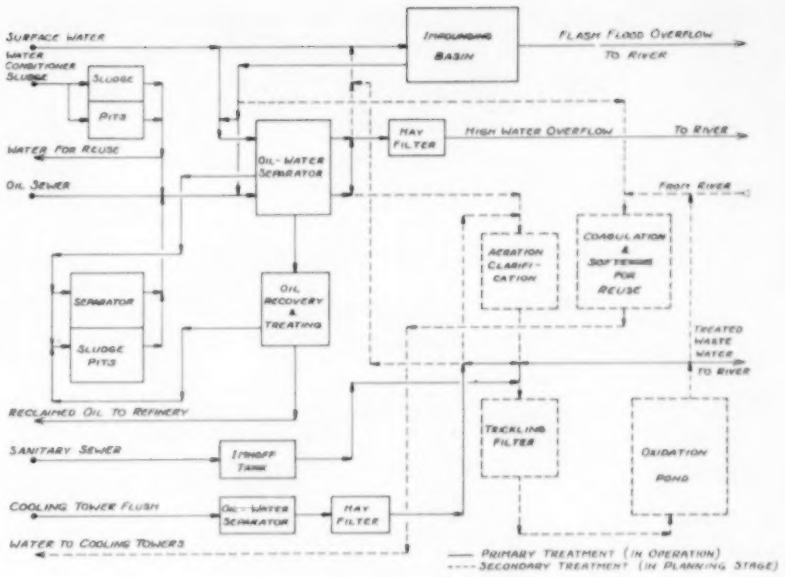
Using these waste-water inspections, our 15,000-g.p.m. oil-water separator required six parallel single-stage chambers, each 20 ft. wide, 72 ft. long, and 7 ft. deep, designed according to the fifth edition of Vol. I of the A.P.I. manual.

Fig. 2 shows the plan layout of the separator. It may be operated as two separate units, i.e., two chambers on process water and four chambers on storm runoff, by the installation of steel gates in the separator fore bay and in the outlet flume, as shown in the illustration. This provides a means for isolating process water and taking it separately to secondary treating facilities.

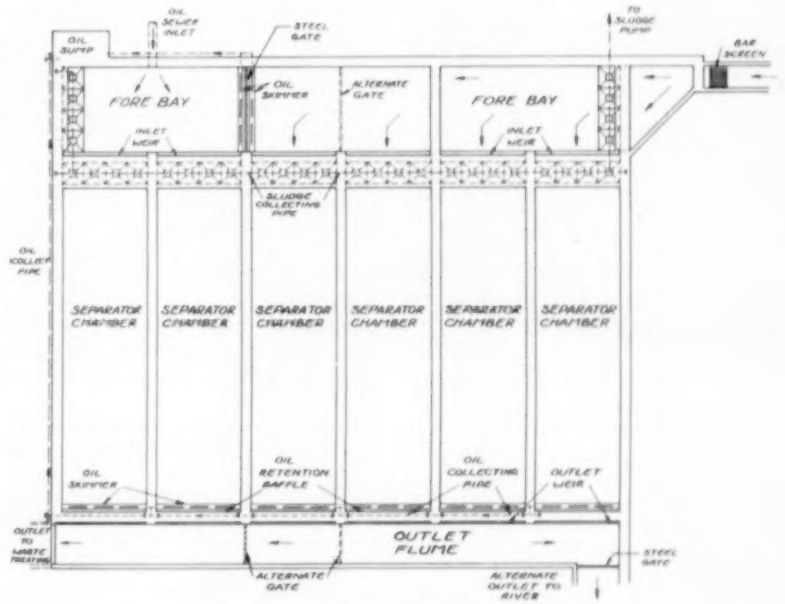
The fore bay has been made 20 ft. wide and equipped with oil-skimming and sludge-removal equipment identical to that used in the separator chambers. Major portions of oil and sludge are removed at this point.

Each pair of oil-skimmer pipes is drained by a single 6-in. pipe installed in the concrete wall between the two respective chambers. While still inside the concrete wall, these 6-in. pipes connect into a 10-in. collecting pipe located parallel to and below the skimmer pipe sand behind the oil-retention baffle. This collecting pipe carries skimmed oil to the sump, where a float-operated pump transfers the oil to tanks located at the site. To allow for pipe cleaning, the collecting pipe has been installed with strategically located flanges.

Four sludge-collecting hoppers are built into the bottom of the inlet end of each chamber and at the inlet and



WASTE-DISPOSAL SYSTEM used at Skelly's El Dorado refinery. Fig. 1.



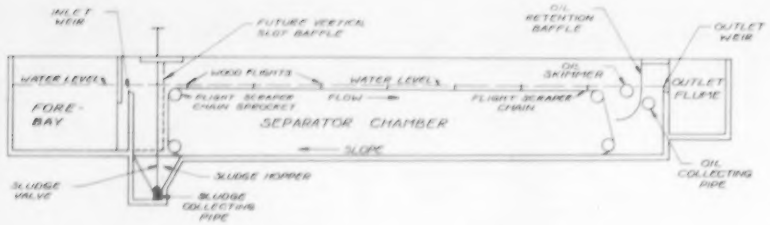
PLAN VIEW of water-oil separator. Fig. 2.

terminal ends of the fore bay. A single 4-in. sludge-collecting pipe carries sludge from the bottom of each hopper to the inlet of a pump which transfers the sludge to a pit. This sludge-collecting pipe is also equipped with special cleanout flanges.

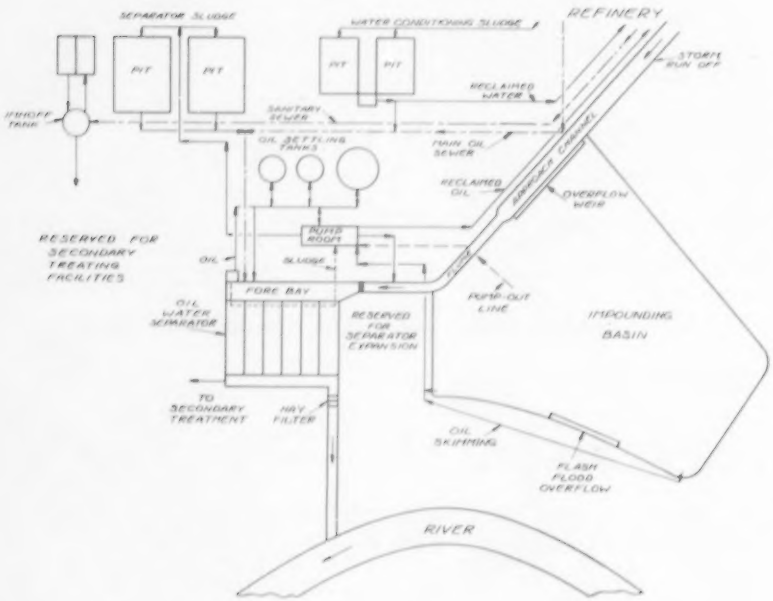
For the purpose of keeping debris out of the separator, a bar screen was installed in the inlet flume just ahead of the fore bay.

A side elevation of one separator chamber is shown in Fig. 3. This illustration shows the relative location of the oil-skimmer pipe, the oil-retention baffle, and the oil-collecting pipe. The oil-retention baffle was extended to the top of the separator wall so as to retain control over oil during periods of extreme flood conditions. The outfall weir extends 1 ft. below the highest known river flood stage. The top of the separator walls extend more than 2 ft. above this highest flood stage.

The valves in the bottom of the sludge hoppers are of our own make. Standard 6-in. gate-valve stems and hand wheels were used. A wheel stand, made from 3-in. pipe, has replaced the valve yoke. The valve seats were ma-



SIDE ELEVATION of one separator chamber. Fig. 3.



OVER-ALL LAYOUT for primary waste-treating equipment. Fig. 4.

Pollution Control

chined from 4-in. steel flanges, and the valve plugs were made from old pressure still-tube header plugs.

The valve stems are of 1-in. pipe. A small rod, welded to the stem, extends through a slot in the valve stand for the purpose of keeping the stem from turning when the valve is operated.

Sludge Pits

Waste water with sludge which is drained from water-softening processes flows through a gravity sewer into the water-conditioning sludge pits. There is 3 ft. of approximately 1½-in. unwashed river gravel in the bottom of these pits. Water seeps through the gravel into a drain pipe. One drain pipe from each pit leads to a common sump. A float-operated pump transfers the water from the sump back to the plant, for re-use.

Each pit was made of such a size that it could hold sludge for 3 to 4 months with the water-conditioners operating continuously.

There is no system of water-collecting pipes under the gravel bed. The 6-in. drain pipe merely extends under the gravel about 6 ft. and enlarges to 8 in. at its inlet end.

Each drain pipe is equipped with a connection for bumping the gravel bed with air should sludge in the gravel block the flow of water. This air-bumping process has been successfully used once or twice.

In addition to the drain pipe, each pit is equipped with an overflow pipe which leads to the sump. This overflow pipe will allow the pit to continue in operation with the drain pipe blocked off. In such an event, sedimentation must be relied upon to provide a clarified pit effluent.

Inside pit walls were constructed with approximately a 3:1 slope so that heavy crawler equipment may be used for sludge removal and pit repair.

Chemical analysis and field testing have proved our water-conditioning sludge to be a satisfactory source for agricultural fertilizer.

The separator sludge pits are built with the same 3:1 slope for inside walls. They have no gravel in the bottom and no water-collecting sump. Each pit is equipped with an adjustable skimming trough. Water and oil which collects above the sludge may be drained or pumped back through the oil-water separator.

Cooling-Tower Flush

The oil-water separator which handles cooling-tower flush water (Fig. 1) was built as part of a fire pump station, and it is located in the refinery, where it becomes part of the fire-protection water-supply system.

Flush water from the cooling towers is collected in a single gravity drain pipe, from which it flows into a retention basin which also serves as an oil-water separator. Two pumps take water from this basin and discharge it into regular mains of the fire-protection system. The basin may also receive makeup water from the regular water-supply system.

The original basin design called for a 2-hour water supply for both pumps, with no water running into the basin. This gave 1-hour retention time for cooling-tower flush at the maximum purge conditions in contrast to about 30 minutes' retention time in our main separator.

Each chamber is equipped with a separate inlet, outlet, and pump suction line so that one chamber at a time may be taken down for cleaning and repairs.

Layout of Equipment

Fig. 4 shows the over-all layout and simplified flow diagram of the primary waste-treating equipment which was installed as an independently operating unit.

Each tank shown in Fig. 4 is equipped with a steam coil located about 3 ft. from the bottom so as to allow room for sludge accumulation. Each tank also has an automatic water-drawoff valve, internal swing pipe, and a clean-out door sheet.

The two small tanks operate in parallel to receive all oil, water, and emulsion skimmed from the separator. The top layer of clean oil is transferred from these two tanks directly to the plant, for rerunning. Water is drained from the bottom of the tanks back into the separator. Emulsions are transferred from the smaller tanks into the large tank.

Whenever practicable, clean oil is recovered from the large tank. As the emulsion increases, the oil is transferred into the refinery for further treatment, for subsequent emulsion breaking, and for ultimate disposal.

The currently used batchwise emulsion-breaking processes, which utilizes heat and demulsifying agents, gives acceptable results, but leaves much to be desired. It adds alkalinity to our cur-

rently alkaline waste effluent. It produces a waste water and a sludge which are difficult to prepare for final disposal. We are considering the merits of a process which utilizes a filter to break emulsions—this in an effort to avoid these sludge and water-disposal problems.

The refinery has no regular storm sewer. Open ditches are utilized to carry storm runoff water into the concrete approach channel. A concrete flume carries the water from the approach channel to the separator fore bay.

Fig. 5 shows the details of adjustable gates installed at the outlet end of the approach channel for the purpose of controlling the flow of water into the inlet flume. The gates adjust horizontally so that floating oil may continue on to the separator at all times.

The approach channel is equipped with an oil-retention baffle and overflow weir along the side next to the impounding basin.

The adjustable gates (Fig. 5) are set so that channel flow must approach 8,000 g.p.m. before the level in the channel will force water out the side into the impounding basin. When the channel level is high enough to force 12,000 g.p.m. through the adjustable gates into the separator, 237,500 g.p.m. will be going over the side overflow weir into the impounding basin. The water going into the impounding basin will come from the bottom of the approach channel. Oil may be expected to collect on the water in the impounding basin in spite of precautions taken in the design of the approach channel. The major portion of this oil will be removed as the basin is pumped empty. However, the impounding basin has been equipped with two oil-skimming trough similar to those installed in the separator sludge pits. These skimming troughs are located in corners of the basin where prevailing winds cause the floating oil to accumulate.

"The completion of these waste-treating facilities brings our waste-disposal construction to the halfway mark....secondary treating facilities constitute a job of about the same magnitude..."

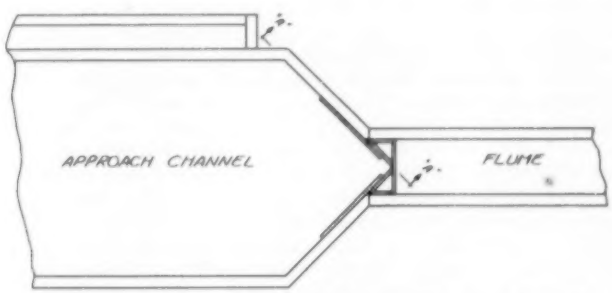
Pump room . . . The pump room shown in Fig. 4 houses two basin pumps, as well as a centrifugal sludge pump and two swinging-vane rotary pumps for skimming and oil transfer. The swinging-vane pumps may be used to pump skimmed oil from the sump when the regular sump pump is down for repair or other reasons.

The pump room is excavated so that the floor level is approximately the same as the sludge-collecting pipe and the impounding basin floor. This facilitates handling of sludge and emptying the basin. The room is equipped with a traveling overhead crane to assist pump and motor repair. An unexcavated end of the building is partitioned into an operating office and an oil and tool room.

Each of the basin pumps has a rating of 5,000 g.p.m. One pump will be able to empty the basin at a suitable rate most of the time.

The inlet end of the suction pipe to the basin pumps is equipped with a swing joint and cable. The end of the pipe may be raised from the water for the purpose of cleaning the intake screen and for working on suction valves inside the pump room.

A round Imhoff tank provides primary treatment for sanitary sewage. The effluent from this tank may be given effective secondary treatment by putting it through a biological filter. In fact, it is almost necessary to be able to seed the biological filter with sanitary sewage before the filter will satisfactorily treat the normal refinery waste water. Septic-tank effluent is not satisfactory for this purpose.



ADJUSTABLE GATE at outlet end of approach channel. Fig. 5.

Bibliography

E. F. Eldridge, Industrial Waste-Treatment Practice, McGraw-Hill Book Co., New York (1942).

Louis T. Monson, "Chemical Resolution of Oil-in-Water Emulsions," Petroleum Engr. 18 (3) 116 (1946).

L. C. Burroughs, "Disposal of Refinery Wastes," Petroleum Refiner 25 (7) 81 (1946).

C. G. Rook, Jr., "Operational Details of Talco's Waste-Water Disposal Plant," The Oil and Gas Journal, 45 (26) 75 (1946).

J. L. Heath and Percy Giblin, "Reclamation of Waste at Beaumont Refinery of Magnolia Petroleum Co.," Petroleum Refiner 25 (9) 117 (1946).

W. B. Hart, "Industrial Waste Disposal for Petroleum Refineries and Allied Paints," 20 original articles in Natl. Petroleum News, 38 (1) R-11 to 38 (32) R-587 (1946) and in Petroleum Processing, 1 (1) 21 (1946) to 2 (9) 691 (1947).

Earle B. Phelps, Stream Sanitation, John Wiley and Sons, New York (1947).

Sheppard T. Powell and E. I. Knoedler, Jr., "Factors Affecting the A.P.I. Design of Separators for Removal of Oil From Waste-Water Effluents," Petroleum Refiner 26 (5) 117 (1947).

E. O. Jordan and William Burrows, Textbook of Bacteriology, W. B. Saunders Co., Philadelphia (1948).

Logan Ross, "New 80,000-G.p.m. Oil-Water Separator Deviates from Conventional Design," Petroleum Processing 3 (2) 114 (1948).

Gordon W. Alexander, "Utilization of Disposal-Plant Effluent in Refinery Cooling Water," Petroleum Refiner 27 (1) 92 (1948).

F. M. Faulconer, D. L. McCann, and H. L. Bedell, "A Method of Conditioning of Refinery Effluent for Re-use and Disposal," Proc. A.P.I. 29M (III) 280 (1949).

G. F. Ullrich, "Esso Standard's Stream-Pollution Control Program," The Oil and Gas Journal 47 (51) 181 (1949).

L. C. Burroughs and R. W. Carnahan, "Disposal of Spent Chemicals from Petroleum Refining," Proc. A.P.I. 29M (III) 293 (1949).

Richard Sneddon, "Modern Art of Tank Bleeding," Petroleum Engr. 21 (3) A-39 (1949).

R. N. Giles, "Oil-Water Separation," Sewage and Ind. Wastes 23 (3) 281 (1951).

Gerard A. Rohlich, Hydraulic Characteristics of Gravity-Type Oil-Water Separators," Proc. A.P.I. 31M (III) 63 (1951).

Nicholas A. D'Arcy, Jr., "Dissolved-Air Flotation Separates Oil from Waste Water," Proc. A.P.I. 31M (III) 34 (1951).

Alfred C. Ingersoll, "The Fundamentals and Performance of Gravity Separation—A Literature Review," Proc. A.P.I. 31M (III) 45 (1951).

W. W. Mathews, "Treatment of Ammonia-Still Wastes by the Activated Sludge Process," Sewage and Ind. Wastes 24 (2) 164 (1952).

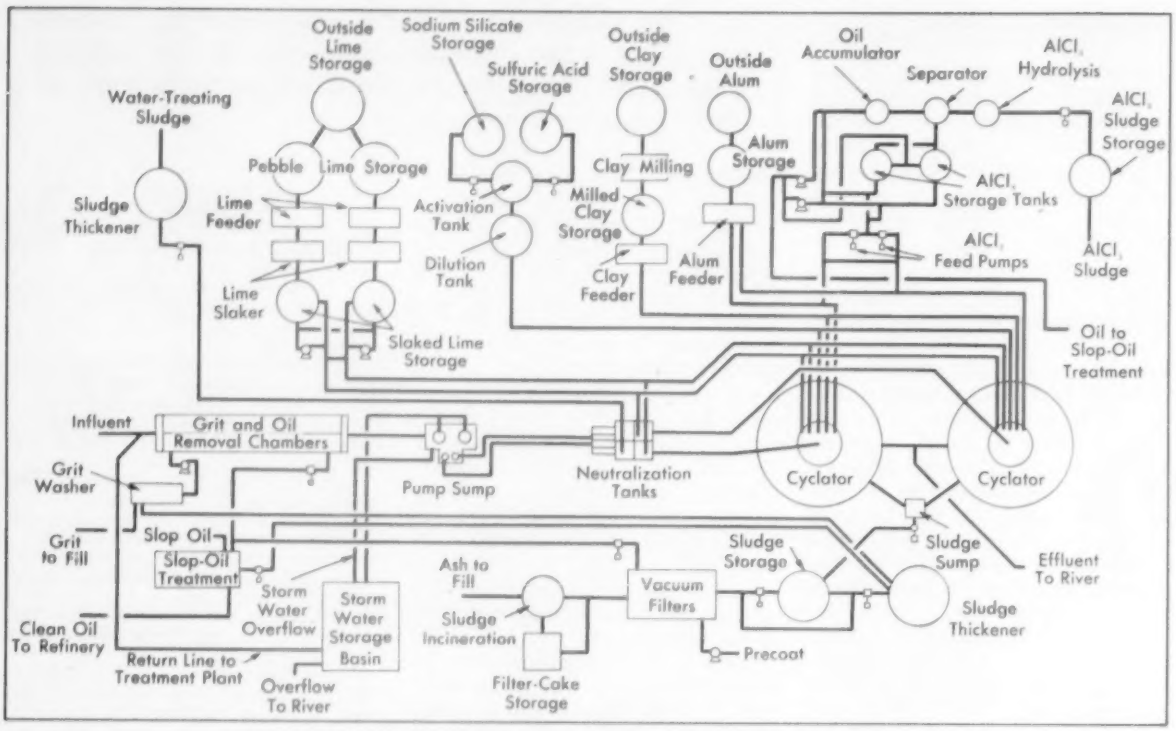
Ross E. McKinney and Murray P. Horwood, "Fundamental Approach to the Activated Sludge Process," Sewage and Ind. Wastes 24 (3) 280 (1952).

H. Heukelekian, C. B. McMenamin, and M. C. Rand, "Performance of the High-Rate Trickling Filters in Series and in Parallel," Sewage and Ind. Wastes 24 (6) 723 (1952).

R. H. Coe, "Bench-Scale Biological Oxidation of Refinery Wastes with Activated Sludge," Sewage and Ind. Wastes 24 (6) 731 (1952).

A.P.I. Manual on Disposal of Refinery Wastes, 4th and 5th edn. (1949 and 1953).

E. Q. Camp, "Filtration Unit in Operation at Humble's Baytown Refinery," The Oil and Gas Journal 51 (11) 67 (1952).



WASTE-TREATING FACILITIES in use at Atlantic's Philadelphia refinery. Fig. 1.

POLLUTION-CONTROL SYMPOSIUM

3. Chemical Flocculation Of Refinery Waste

...Atlantic's program at Philadelphia plant

by Roy F. Weston and R. G. Merman

ATLANTIC REFINING CO. has in operation a 10,000-gal. per day chemical flocculation waste-treatment plant at its Philadelphia refinery. The plant was specifically designed to:

- Reduce effluent oil content below 30 p.p.m.
- Reduce organic pollution so that dissolved oxygen content in the Schuylkill River does not drop below 2 p.p.m.
- Control effluent pH to minimum value of 6.0.

Operation to date has been satisfactory, and modifications and improvements now planned or under way will contribute to greater efficiency and better operation.

Results of preliminary investigations reported elsewhere[1,2,3] indicated the plant should be constructed as shown in Fig. 1. The basic treatment operations include: (1) oil separation, (2) chemical flocculation, (3) sludge dewatering, and (4) sludge incineration. The waste water passes through an oil separator to neutralization and chemical flocculation facilities and thence to the Schuylkill River. Separated oil is pumped to slop-oil-treating facilities and settled suspended solids are dewatered and then incinerated. The ash is deposited as fill.

Authors associated with Atlantic Refining Co., Philadelphia.

Preliminary treatment . . . Waste water enters the plant via a 7-ft. duct reinforced-concrete sewer. At the entrance of the grit and oil separator, the water passes through 1-in. opening bar screens to remove large debris. In the separator, oil is collected at the surface and settleable material (sludge) is collected at the bottom. Chain-type collection mechanism moves oil to the outlet end of the separator and sludge to the inlet end. Accumulated oil is skimmed into a float-controlled trough from which it is continuously pumped to slop-oil-treating facilities.

Sludge is scrapped into a hopper from which it is pumped intermittently to a grit washer. The grit washer is a hydraulic classifier that separates sand and gravel from the sludge. The sand and gravel is dewatered and washed by an inclined screw as it is elevated above the water level in the unit. The dewatered material is dropped into a skid for use as fill. The fines overflow the grit washer into the auxiliary thickener.

The separated waste water flows under the oil skimmer and through a weir into a pump sump. Dry-weather flow and storm-water flow up to 19.2 thousand gallons per day is pumped to the inlet compartment of the neutralization tanks. Flows in excess of 19.2 thousand gallons per day are pumped to a storm-water basin with storage capacity for a 1-year storm. Flow in excess of a 1-year storm flows under a baffle over a broad-crested weir and into the Schuylkill River. Accumulated water is returned to the inlet end of the separator for oil and grit separation and thence to the pump sump for discharge to the chemical treating section of the plant.

Neutralization . . . The waste water flows from an inlet compartment into two neutralization tanks in series over rectangular sharp-crested contracted weirs. Each neutralization tank is equipped with turbine-type mixers and piping for the addition of slaked-lime slurry and boiler-feed-water treatment sludge. The wastes are neutralized by adding these materials under automatic pH control. The neutralized waste flows to chemical flocculation tanks known as cyclators. Here it is mixed with coagulants, coagulant aids, and recycled flocculation suspended solids.

Aluminum chloride and alum may be added as coagulants and activated silica, clay, and lime slurry may be added as coagulant aids. The floc formed by the coagulants and coagulant aids together with the recirculated preformed floc enmesh suspended oils and solids and clarify the waste. As the floc settles from the treated waste water, it carries the contaminants with it to the bottom of the cyclator as sludge. The treated waste water overflows the cyclators through orifices and drains to a clarified effluent sump and thence to the Schuylkill River.

The sludge is concentrated and scraped to drawoff sumps in the cyclators from which it is drained intermittently under automatic control to a sludge sump. Sludge is pumped from the sump to a storage tank under liquid-level control.

Filters . . . From the storage tank, sludge is pumped to rotary vacuum precoat filters. Automatic controls adjust the flow to the filters equal to the filtration rate. Water is drained from the sludge solids to the inside of the filter drum. This filtrate drains by gravity to a filtrate receiver from which it is pumped to the plant sewers.

The relatively dry cake and a thin layer of precoat is cut from the surface of the filter and discharged onto a continuous belt conveyor. The conveyor carries the filter cake to a single rotating hearth incinerator where the oil and other organic matter is burned from the sludge. Sufficient oil is normally present so that heat will be produced in excess of that required to sustain combustion. A combustible free ash is pneumatically conveyed to an ash storage hopper from which it is dumped to trucks for disposal as fill.

Miscellaneous sludges and bottoms are collected in a tank known as an auxiliary thickener. Materials accumulated in this tank are dewatered or deoiled on the vacuum precoat filters. One filter is equipped so that it can be used for slop-oil filtration.

The plant has been designed for sustaining operation 100 per cent of the time and for providing maximum flexibility of operation. All major units have been provided in duplicate, each of one-half design capacity. Where duplication was impractical, provisions have been made for sustaining operations by storage facilities for process materials, bypass arrangements, or inventories of spare parts.

TABLE 1—DISTRIBUTION OF CONSTRUCTION COSTS

Item—	Per cent of total
1. Connecting and area sewers	12.1
2. Separator and grit washer	8.4
3. Neutralization and flocculation	13.4
4. Chemical-handling equipment	4.3
5. Sludge thickeners	3.0
6. Filters and accessories	6.4
7. Incinerator and accessories	5.4
8. Building	5.9
9. Pumps and starters	6.1
10. Instruments and panels	4.8
11. Piping	12.8
12. Electrical	5.4
13. Storm-wash basin	7.5
14. Site clearance, outside services, grading, paving, etc.	4.5
Total	100.0

Cost of construction . . . The cost of construction of a plant such as this, exclusive of land, may be expected to range from $2,500,000 to $5,000,000 (1953 basis) depending on local conditions and details of design. The area required, exclusive of the storm-water basin, is about 3 acres. The storm-water basin occupies about 2.25 acres.

The distribution of construction costs for the plant is shown in Table 1.

"The cost of construction of a plant such as this, exclusive of land, may be expected to range from $2,500,000 to $5,000,000, depending on local conditions and details of design."

Manning the Plant

The plant is manned on a shift basis using four operators under the immediate supervision of a nontechnical shift foreman. This foreman spends part of his time following other operation activities. The operators are titled: water-treatment operator, sludge-treatment operator, control operator, and utility operator. Their duties are as follows:

The water-treatment operator has oversight supervision for the entire plant and personally operates the wastewater pumps; the chemical handling, aluminum chloride hydrolysis, and neutralization equipment; the cyclators, and the clarified water system.

The sludge-treatment operator operates all sludge-handling facilities including the pumps, thickeners, vacuum filters, and incinerator.

The control operator performs essential laboratory control tests and assists the other operators as needed.

The utility operator lubricates equipment, makes chemical transfers, performs housekeeping duties, and assists the other operators.

In the daytime, a utility man handles the unloading of chemicals, the dumping of diatomaceous earth for precoating the vacuum filters, and good-housekeeping duties.

The handling of dry chemicals and treatment sludges is a very dirty operation. At this particular time, several men per day are required for plant cleanup. Changes, under consideration but as yet incomplete, should reduce the manpower required for this purpose.

Training program . . . None of the men now operating the plant had any familiarity with the processes or equipment used at this plant. Therefore, the technical section prepared a formal training program, including training manuals describing the basic flow systems of the plant.

The shift foremen were trained first. They were required to perform laboratory experiments to become familiar with important process and variables and to run small pilot-plant equipment to learn of the variables of chemical flocculation and vacuum filtration. They visited the plant under construction regularly and visited plants in the neighboring area to observe the operation of individual pieces of equipment similar to those to be used in the plant. After a thorough indoctrination in fundamentals, the shift foremen were assigned the job of writing detailed job breakdowns for every routine operation. About 30 working days were spent in classroom and field training and about 30 working days were spent in preparing the job breakdowns.

The operators were given a 15-day course in fundamentals by technical section personnel. Then they were turned over to the shift foremen for detailed operation training using job breakdown manuals and on-the-job training. All operators were required to pass written tests on fundamentals and were required to satisfactorily execute dry runs on plant equipment.

Startup Problems

The oil content of the waste water not susceptible to separation averaged about 200 p.p.m. during our test-run

period. This is about 80 per cent of the total oil concentration originally expected in the separator effluent.

These conditions contribute to the relatively poor quality of effluent leaving the separators. High oil concentrations in the flow entering the chemical treatment section of the plant have resulted in high chemical requirements and poor settling in the cyclators.

Grit and oil separator . . . Initially, some difficulty was experienced in pumping grit from the separator. Open impellers have been provided for the pumps and operate satisfactorily. Excessive wear of pump-shaft sleeves has been corrected by the installation of flushing water to the glands. An auxiliary supply of high-pressure water connected to the pump suctions has been successful in clearing occasional blockage.

Considerable breakage was experienced with the high-silicon iron pipe used for the grit-removal system. Steel pipe and fittings have given no trouble in 10 months' operation as replacements for the high-silicon iron.

The facilities provided for removal of separated oil have not performed as well as expected and undoubtedly contribute to the high oil concentrations in the separator effluent. The position of the automatic baffle and skimmer is somewhat affected by the quantity of liquid in the trough resulting in undesirable elevations of the skimming weir. The effect of this condition was somewhat improved by replacing the rectangular skimming weirs with triangular weirs, so that flow into the trough was not as sensitive to variations in the head over the weir. To further facilitate oil skimming, it is planned to control the skimming pumps by the level in the trough. Currently the pumps are manually controlled, resulting in the trough intermittently being pumped dry or being flooded.

Floating debris passing through the bar screens has resulted in plugging in the skimming pumps and pump suctions. The clearance in the pump valves is only about ½ in. Work is in progress to install ¼-in.-mesh double pot strainers on each pump section and 1-in.-mesh strainers on the skimmer trough.

Original pistons and rings on the skimming pumps have worn rapidly due to the abrasive nature of the skimmings. Darcova assemblies have been used successfully as replacements.

Cyclators . . . At times of cyclator upset, considerable sludge rises to the surface between the outer draft tube and inner launder. This material deteriorates the effluent quality by flowing through the rectangular weirs provided in the launder to keep the surface clean. A rotating surface skimmer will be installed to remove this material.

"The lack of scrupulous care in keeping the gravimetric feeder belt assembly clean lead to uncorrected increased tare weight, giving lower actual feed rates than indicated."

Chemical feeding and handling . . . After about 3 months' operation, the chilled cast-iron agitators in the lime slakers became so badly worn that they no longer provided adequate agitation. This led to blocking in the slaking compartment and poor lime-slurry quality. Rubber coating and abrasion-resistant alloys are being considered for replacement agitators.

The lack of scrupulous care in keeping the gravimetric feeder belt assembly clean led to uncorrected increased tare weight, giving lower actual feed rates than indicated. As a result, excess water was used in slaking and a poor-quality lime slurry was produced.

Some blockage has occurred in the lime-slurry distribution system, particularly where there are comparatively long runs from the control valve at the recirculation header to the cyclators. Work is under way to eliminate these long gravity runs by extending the recirculation header.

Clay. Extremely rapid wear of the original manganese steel, clay mill hammers has been experienced. Studies in progress to find a suitable alloy for this service indicated approximately 80, 90, 100, and 110 hours' equivalent service has been somewhat alleviated by using burned spent clay. The use of substitute weighting agents are under study. These include spent catalyst from cracking operations and ground ash from the treatment-plant incinerator.

Aluminum chloride. Considerable breakage was experienced with the

TABLE 2—CHEMICAL FLOCCULATION DATA

Influent—	Flow (1,000 gal./day)	pH	S.S. p.p.m.	Turb. p.p.m.	Oil p.p.m.	C.O.D. p.p.m.	B.O.D. p.p.m.
Number of tests	30	30	30	30	30	30	24
Average	13.4	8.1	187	114	616	2,360	694
Median	13.3	8.3	107	91	426	2,000	428
Range	12.4-14.8	4.5-11.6	12-1,080	22-450	41-2,540	550-15,000	156-4,100
Effluent—							
Number of tests	30	30	30	30	30	30	24
Average		9.7	148	66	234	970	304
Median		9.9	50	24	34	440	160
Range		7.2-11.0	4-1,340	4-570	3-4,000	29-7,050	65-2,060
Per cent reduction—							
Number of tests	30	30	30	30	30	30	24
Average			—25.4	37.6	52.2	52.5	43.5
Median			50.4	79.0	89.0	75.1	62.3

TABLE 3—CHEMICAL USE DATA

Chemical—	Average	Use median	Range
Alum, tons per day	5.1	1.8	0- 18.7
Aluminum chloride (tons per day alum equivalent)	7.6	6.5	0- 16.1
Lime, tons per day	17.2	13.6	1.4- 21.4
Sodium silicate, gallons per day	701	763	0-1,997
Sulfuric acid, 98 per cent, gallons per day	81	70	0- 261
Spent clay, tons per day	3.1	3.1	0- 6.3
Diatomaceous earth, tons per day	1.2	1.3	0- 3.0

TABLE 4—SLUDGE-HANDLING DATA

Item—	Average	Median	Range
Sludge volume, gallons per day	162,400	155,000	119,900-201,300
Sludge quality, per cent:			
Water	91.4	91.3	86.2 - 95.4
Oil	4.3	3.9	2.3 - 11.5
Solids	4.3	4.7	2.1 - 7.8
Gravity	1.010	1.009	1.000- 1.030
Filter cake weight, tons per day	63.4	67.7	15.9 -157.9
Filter cake quality, per cent:			
Water	58.1	57.4	47.0 - 65.8
Oil	21.2	22.3	14.5 - 30.2
Solids	20.7	20.3	19.7 - 22.8
Ash	13.7	13.4	13.3 - 14.2

chemplas pipe and valves used in the aluminum chloride hydrolysis system. Tight joints were difficult to secure with a relatively incompressible asbestos-filled-type gasket originally used. As a result, much pipe was broken in an effort to stop leaks. The substitution of neoprene gaskets was an improvement. Some pipe was broken as a result of thermal expansion.

Two small breaks in the glass lining of one of the vessels were satisfactorily repaired with tantalum plugs.

Sludge-handling system . . . The abrasive nature of sludges from the cyclators and particularly from the auxiliary thickener has caused rapid wear of the sludge transfer pumps. Failure of piston rings and scoring of pistons, rods, and cylinder liners have occurred. Darcova cup assemblies have been installed on one of these pumps with good results. It is planned to modify the other two pumps in this manner and to install liners and rods made of an abrasion-resistant alloy.

The sludge-conveying system has given considerable operating difficulty. The original belts were not oilproof and were soon attacked by the oil in the filter cake, resulting in nearly continual misalignment. Replacement with oilproof belting and installation of self-aligning roller guides in place of stationary pipe roller guides originally provided have reduced the alignment problem.

The scrapers provided to remove cake from the belts have not proved satisfactory. Cake remaining on the belts fall off on the return flight, collecting on the floor and fouling the drive pulleys and idlers and resulting in belt misalignment. Means of a more positive cleaning of the belts are being investigated.

Vacuum pumps . . . Water entering the vacuum pumps has caused failure of a piston in one pump and a cylinder head in another. Barometric loops, high-level alarms in the filtrate receivers, and moisture traps have failed to prevent this occurrence. The high-level alarms failed soon after start up, apparently due to turbulence in the filtrate receivers. Plans are under way to relocate the high-level alarms outside the receivers and to provide additional water-knockout facilities.

Effluent water system . . . The control equipment provided to maintain constant pressure in this system has presented a problem. Pressure switches which start additional pumps at times of high demand have caused these pumps to cycle rapidly under certain conditions. This rapid on-off operation has led to motor failure on two of the three pumps. Means of eliminating this condition are being investigated.

"The sludge-conveying system has given considerable operating difficulty. The original belts were not oilproof and were soon attacked by the oil in the filter cake, resulting in nearly continual misalignment. Replacement with oilproof belting and installation of self-aligning roller guides in place of stationary pipe roller guides originally provided have reduced alignment problem."

Operating Data

The plant has been in operation such a short period of time that it has been impossible to correct all of the initial operating problems. Therefore the data presented herein must be considered preliminary and tentative.

Screening . . . Trash and wax accumulate on the bar screens. The screens require cleaning about every 2 weeks and after each heavy rainfall. Nominal accumulations of wax are dissolved.

Grit removal . . . The removal quantity of grit collected during the past 10 months is about 22 tons per month. The maximum daily collection was about 8.5 tons. The analysis of the washed grit is as follows:

Constituent—	Composition (per cent) Average	Range
Water	18.7	4.7-35.8
Oil	16.2	6.6-26.2
Solids	64.9	42.8-84.4

This material has been entirely satisfactory for disposal as fill.

Chemical flocculation . . . Typical current operating data are shown in Table 2. These data are based on 10 days' operating results. Each day spot samples were collected every 2 hours. Three sets of these samples were selected for analysis by chance using a shuffled deck of cards. The chemical use data for the test period are shown in Table 3.

Shown in Table 4 are the flow and characteristics of sludge charged to the filters and the cake discharged. The for manganese steel, work-hardened manganese steel, stellite-tipped, and case-hardened carbon steel hammers, respectively.

Considerable difficulty was encountered dispersing ground spent filter clay in water prior to feeding. The problem filter cake contains about 15 per cent more water than anticipated. It is expected that this can be reduced as more experience is obtained in the operation of the filters.

References

1. Weston, Roy F., R. G. Merman, and J. G. DeMann, Industrial Plant Waste-Disposal Survey, Sewage Works Journal, Vol. 21, pp. 274-285, Mar. 1949.

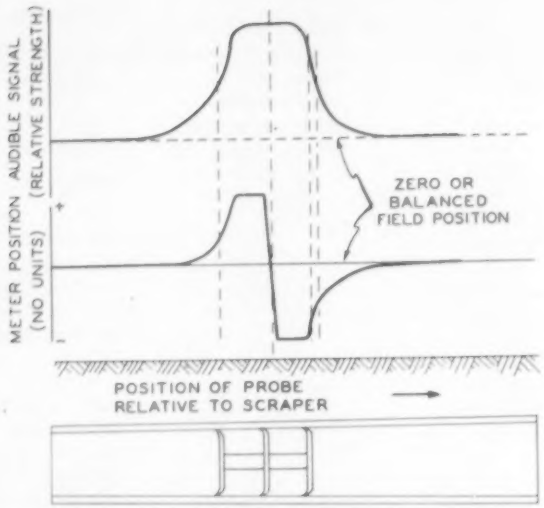
2. Weston, Roy F., Separation of Oil-Refinery Waste Materials, Ind. and Eng. Chem., Vol. 42, pp. 607-612, Apr. 1950.

3. Weston, Roy F., R. G. Merman, J. G. DeMann, Coagulation of Refinery Wastes by Twin Pilot-Plant Unit, Proceedings of the Fourth Industrial Waste Conference, pp. 290-313, Purdue University, 1948.

4. Dobbins, W. D., Effect of Turbulence on Sedimentation, Transactions A.S.C.E., Vol. 109, pp. 629-656, 1944, and Thomas R. Camp, Sedimentation and the Design Settling Tanks, Proceedings of A.S.C.E., Vol. 71, No. 4, pp. 445-486, Apr. 1945.

THESE CYCLATORS handle wastes after neutralization.

OPERATOR DEMONSTRATES lightweight instrument used in locating pipeline scrapers. Fig. 1.



HERE'S A GRAPH of what he sees and hears as the scraper is approached and passed. Fig. 2.

Where's That Pig?

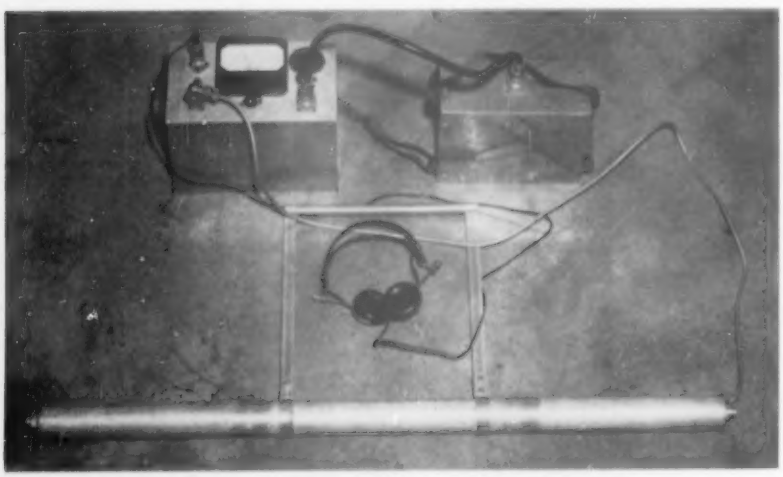
Marking the exact location of stuck pipeline scrapers is a simple process with the aid of this electronic instrument. The instrument is very sensitive to slight changes in magnetic field intensity and, when used with a magnetized scraper, will detect the scraper through 10 ft. of backfill.

by W. H. Stewart

A MAGNETIC-SCRAPER locator is used by personnel of Sun Pipe Line Co. to solve a tricky operational problem of locating quickly and accurately a pipeline scraper which may lodge during a scraper run. In the past few years several methods, each successful to some degree, have been developed for locating scrapers, but the use of the detector is one method that assures rapid scraper location along with pinpoint accuracy.

The instrument consists of a detector probe, an electronic amplifying circuit, an indicating meter, a pair of earphones, and a batter power supply. The assembly is mounted in two cases plus the detector probe and has a harness for portable use. An operator is shown demonstrating the detector in Fig. 1.

In scraper operations it is used in conjunction with a magnetized scraper which may be a standard scraper with a hardened-steel shaft which has been magnetized, or may be a scraper which has been modified by having several Alnico magnet bushings stacked on its shaft. In the latter case, the instrument is sensitive enough to detect the scraper from a distance of 10 to 20 ft.



BATTERY AND METER CASE plus detector probe of this compact instrument weigh only 17 lb. Fig. 3.

Normal use . . . Although the instrument is ideal for tracking or following scrapers, modern pipelining methods

Author is corrosion engineer for Sun Pipe Line Co., Beaumont, Tex. The instrument here described is covered by U. S. Patent No. 2642479.

render this "fast walk" unnecessary in most cases. The general procedure is simply to verify the passage of the scraper at easily accessible road crossings. With mobile radio, the operator is usually in direct contact with the pumping point and is informed immediately of any interruption in pumping. Thus, unless the scraper hangs, the operator has little reason to backtrack and locate the pig.

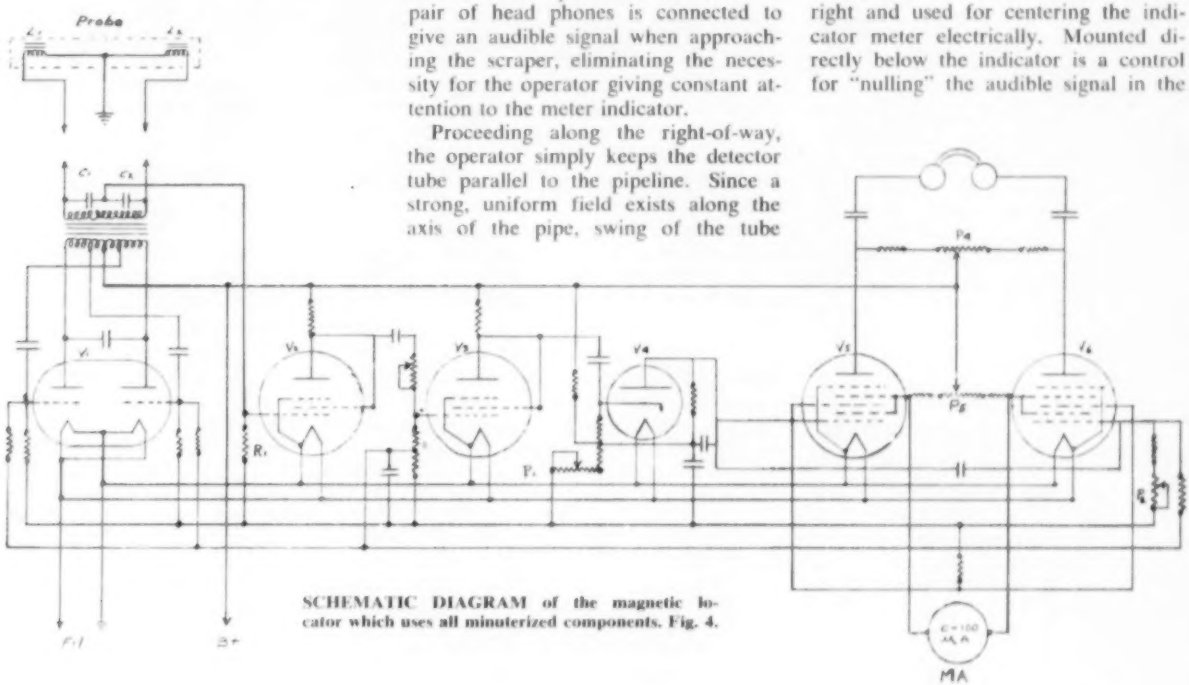
However, pipeline scrapers have a way of getting stuck and frequently of becoming lost. Even with various noise makers which may have been attached to the scraper, field personnel who may have been "chasin' the pig" will have only a general idea as to its location when it stops moving.

It is under these circumstances that the magnetic locator really comes into its own. For portable field use, in such cases, the detector assembly is carried by the operator as shown in Fig. 1. It consists of a probe—the actual detector—mounted in a nonferrous tube and carried parallel to the pipe with minimum swing. The electronic equipment and indicating meter are housed in the aluminum case in front of the operator while the batteries are contained in the case on the operator's back. A suitable harness, adjustable to the individual, balances these containers over the operator's shoulders. A pair of head phones is connected to give an audible signal when approaching the scraper, eliminating the necessity for the operator giving constant attention to the meter indicator.

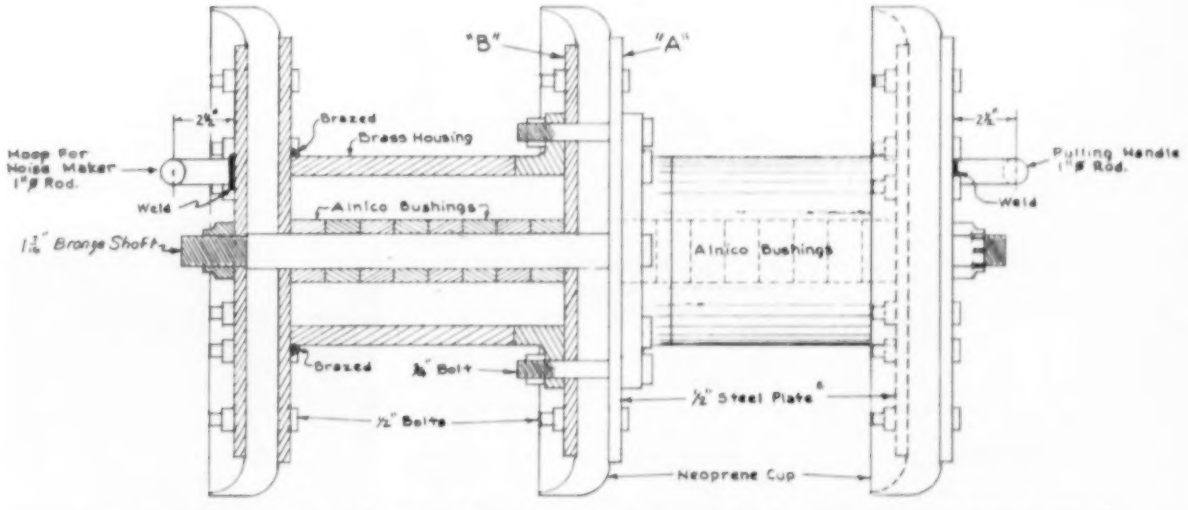
Proceeding along the right-of-way, the operator simply keeps the detector tube parallel to the pipeline. Since a strong, uniform field exists along the axis of the pipe, swing of the tube will give some unbalance but the experienced operator soon becomes familiar with this regular tone change and is not misled by it.

As the scraper is approached, a definite increase in signal is audible and the indicator meter rapidly goes offscale in one direction. Upon passing over the scraper the meter reverses to offscale in the other direction as the tube end passes the pig. With the probe again in a uniform field, the indicator needle returns to the zero-center position. (See Fig. 2.)

The complete unit, shown in Fig. 3, weighs a total of 17 lb. with batteries. On the control box two adjustments, coarse and fine, are mounted on the right and used for centering the indicator meter electrically. Mounted directly below the indicator is a control for "nulling" the audible signal in the



SCHEMATIC DIAGRAM of the magnetic locator which uses all minuterized components. Fig. 4.



CROSS-SECTION of magnetized scraper for 20-in. pipeline. Note brass shaft and housing for magnet bushings. Fig. 5.

ear phones. These together with suitable shielded cable terminals from the probe and battery box comprise the physical arrangement of the control box.

The probe consists of an aluminum tube containing the magnetic sensitive elements. As pictured, this piece of equipment is arranged for easy carrying and is connected to the control unit through a shielded cable.

Electrical circuit . . . A basic wiring diagram of the detector unit is shown in Fig. 4. The saturable reactors L1, L2, and the condensers C1, C2, form a bridge with output appearing across the resistor R1. These reactors are saturated by the 600-cycle output of the oscillator through the transformer T1. Since an external magnetic field will change the part of the cycle during which the reactor is saturated, any difference in magnetic field between the two reactors will cause each to saturate on different parts of the cycle with a resulting output appearing across R1.

This output is fed into a two-stage a.c. amplifier V1, V2. This amplified signal is peak rectified and is bucked against a constant d.c. voltage to give a small net negative voltage. This net voltage is applied to a bridge-type d.c. amplifier V5, V6.

With the probe element in a uniform magnetic field the indicator needle is centered by adjustments of P1 and P2 (coarse and fine). With this step completed, the audible signal, which is unfiltered ripple from the rectified signal, is nulled by adjustment of P4 and P5. With the instrument thus adjusted, any change in magnetic field intensity between L1 and L2 will appear as a deflection on the indicator MA and a definite increase in tone in the head phones.

Scraper modifications . . . The scraper itself can take a variety of forms and several types of conventional scrapers have been adapted for use with the detector. Those with hardened-steel shafts can readily be magnetized and adapted for use with the detector. The type developed by the writer (see Fig. 5) was the result of expediency on a new construction job with no large scraper readily available. It is simply an elaboration on the simpler three-cup plug frequently used for initial runs through newly constructed lines. These plugs were constructed to utilize Alnico bushings already on hand.

It is easily constructed, effective in cleaning debris from new lines, and readily located. Though we haven't found it necessary yet, the field about the pipe can be strengthened by addition of wheel-type, steel-wire brushes assembled on each end of the plug.

In the smaller sizes, from 4 to 12-in., the components are assembled on a bronze shaft with conventional disks and cups and with Alnico bushings serving as both spacers and magnets.

The magnetizing of the bushings is relatively simple. Fig. 6 shows the unit consisting of an elongated 4-in. diameter coil wound with two layers of No. 10 square copper wire is rigidly centered in a 30-in. section of 6-in. pipe with the bottom end closed by a welded plate. The bushings are placed within the coil and stacked on a brass pipe guide fastened to the bottom plate. A steel plate, fitted with a heavy welded bushing containing a 2½-in. solid steel bar, caps the assembly and the bar completes the magnetic circuit. Magnetizing is completed with a few seconds of energizing from a welding machine.

Field experiences . . . In over 6 years of use, no failure or appreciable decrease in magnetic strength of the scrapers has been noted. In heavy service with high pump pressures it is advisable occasionally to remove the magnets and clean the faces of grit or foreign matter forced in by pressure. Care should be exercised in the assembly of magnets to guard against any foreign matter between faces, which will reduce the over-all efficiency.

From field experience, one incident is worthy of note here. In running a cleanout or displacement plug through an old 6-in. line prior to abandonment and removal, the plug failed to appear at a check point downstream from an abandoned station site. The only possible obstruction was a block gate, which, the field foreman assured the operator, hadn't been closed in 15 years. Although the valve offered quite a change in field intensity, the operator by making check passes by other similar valves at carefully spaced distances, satisfied himself the plug was stopped in the valve. Such was the case and an examination of the valve indicated it had been only half open for the 15 years.

ADJUSTABLE PLUG TO COMPLETE MAGNETIC CIRCUIT
BRASS GUIDE FOR ALNICO BUSHINGS
MICARTA TUBING
CONTINUOUS WINDINGS ENTIRE LENGTH OF MICARTA TUBING
6-IN PIPE CASE

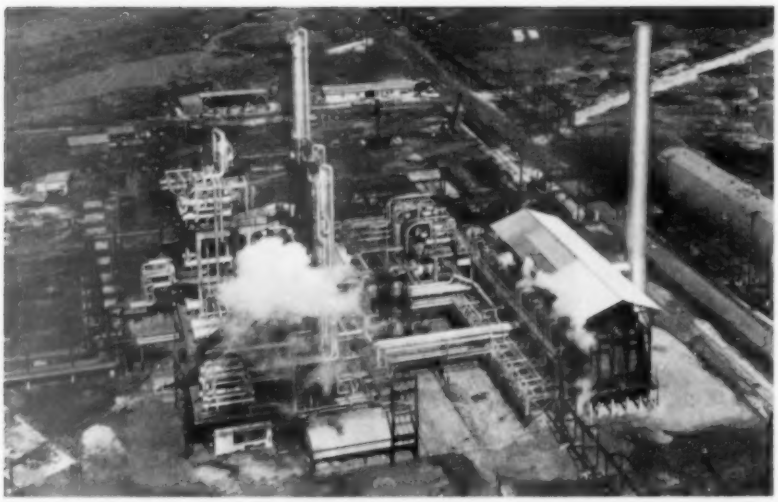
ASSEMBLY for use with welding machine in magnetizing Alnico bushings. Fig. 6.

Handy Line-Tapping Machine

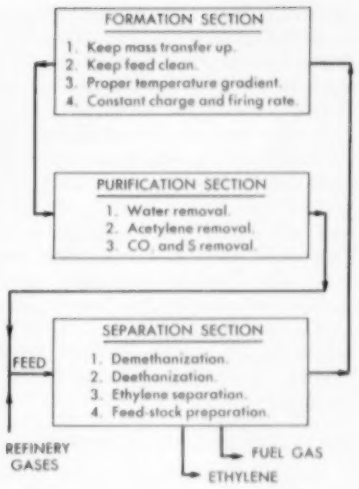
A MODEL A differential, three tubular guide rods, two universal joints, a few pieces of scrap metal, and a considerable amount of pipeliner's know-how transformed a hand-powered tapping machine into a fast, truck-powered device for Gulf Refining Co.'s East Texas pipeline district.

A rear wheel of a pickup truck is jacked up to provide power for the machine, with a connection being made by a drive shaft and two universal joints. With the tool, three men are able to make a line tap in about 45 minutes.

The assembly was designed by District Foreman Guy Crisman, (now retired), and Field Mechanic Charles Thorpe, both of Gulf's East Texas district.



Ethylene unit is in foreground with steam and power plant in center and Gulf Oil Corp.'s Port Arthur refinery to the right in far background.



Main steps in Gulf's ethylene manufacture, including precautions taken to minimize coking in the ethylene formation step. Fig. 1.

PETROCHEM REPORT... ETHYLENE—2

Ethylene's Big Business With Gulf

. . . and here's how some of the problems its manufacture entails are solved

by P. W. Cornell,* W. H. Litchfield,† and H. M. Vaughan†

ETHYLENE is a basic raw material, and the larger profits come from its conversion to consumer products rather than from its basic manufacture. Nevertheless, it is believed that the principal attraction to the purchase of ethylene, rather than its manufacture, is not solely a matter of economics. Purchase of ethylene from a manufacturer whose plant is associated with a large refinery can represent a stable raw-material supply system. This can be extremely important to a company without an assured raw-material supply.

Many chemical companies which manufacture their own ethylene have, in recent years, been faced with erratic L.P.G. prices. Unusual weather of one sort or another has, on numerous occasions, sent L.P.G. prices spiraling upward. The cookstove and space heater can pay a great deal for fuel if the need arises, and there is an old adage that, in a period of shortage, the manufacturing plant cannot compete with the cookstove for these materials. This is particularly serious for the manufacturer whose competitor is not at the same disadvantage as regards his raw-material supply.

Therefore, an ethylene contract is, among other things, a contract for raw material for a long term, and at a stable and equitable price.

Raw-Material Supply

When refinery gas is processed, the feed supply must be controlled by spilling; i.e., the ethylene plant will take as much gas supply as it needs, and will spill the remainder back to the refinery fuel system. This may mean a substantial amount of excess compression, because the gas streams which are to be mixed must be sufficient to insure a relatively uniform composition to the ethylene unit. Even with such a spill-back arrangement stable ethylene unit feed can only be obtained in a large refinery which has numerous gas-producing units.

Refinery fuel gas . . . Not only does the ethylene plant return the lower-B.t.u. components of the feed gas to the refinery; but, in addition, when the by-product gas from ethylene manufacture itself, which consists largely of methane and hydrogen, is added to the refinery gas fuel, the net result is that the B.t.u. per cubic foot of the refinery gas stream is materially diminished. This need not be serious if proper provision is made for the accommodation of the changed nature of the fuel gas.

The installations may include equipment for flaring large volumes of gas during short periods of upset, or in case of failure of the ethylene plant equipment. In addition, the ethylene-unit feed system must provide a feed-gas spill of sufficient volume to assure minimum upset of the ethylene unit when refinery units go off and on, or when the operating rate of the ethylene unit needs to be changed.

Availability of Finished Product

Gulf Oil Corp.'s distribution system involves more than 130 miles of pipeline, and the fluctuations in pressure which such a line can tolerate can provide a substantial amount of ethylene storage.

Storage . . . Although the storage capacity of the pipeline serves to smooth out variations in producing-plant operations, Gulf has found that the needs of its customers, as well as the type of manufacturing operations involved, require a substantial additional amount

*Gulf Oil Corp., Pittsburgh. †Gulf Oil Corp., Port Arthur, Tex. From paper presented at A.P.I. division of refining mid-year meeting, Houston, 1954.

of storage. Any type of ethylene storage is exceedingly expensive; therefore, it is improbable that 30 to 60 days' storage will ever be attained, as is customary for most of the products of the oil industry. Nevertheless, a stable source of ethylene requires a substantial investment in ethylene storage.

The problems in ethylene storage are the same as for propane storage only more so. The temperatures must be lower, and the pressures must be higher. Moreover, the lower density of the stored material requires a substantially larger storage volume for the retention of the same weight of stored material.

A High-Energy Operation

For easy illustration, Table 1 compares the manufacture of ethylene with a few common refinery operations, on a basis of the power-input requirements of each of the processes. We could have used energy input on the basis of fuel and steam consumption, but the use of rotating and reciprocating machinery also serves to illustrate the higher demand for maintenance and service.

Ethylene Formation

An ethylene unit consists of three fundamental parts, as shown in Fig. 1: ethylene-formation, purification section, and ethylene-separation. Several types of ethylene-formation processes are available. By far the most common is that which employs some sort of externally fired tubular coil by means of which the feed stock is thermally cracked so as to provide ethylene in a mixture of hydrogen and other hydrocarbons. The only other ethylene source used by Gulf is byproduct ethylene contained in the refinery gases made in cracking operations.

TABLE 1

Type of Plant	Units of Salable Product Per Unit of Mechanical-Energy Input
Ethylene unit	1
Fluid catalytic cracking unit	40
Lubricating-oil solvent-treating unit	200
Crude-oil topping and vacuum unit	700

Numerous other methods for the formation of ethylene have been used or proposed. The most widely known of these cracking processes employ pebble heaters, refractory checker heaters, and partial-oxidation reactors.[1,2]

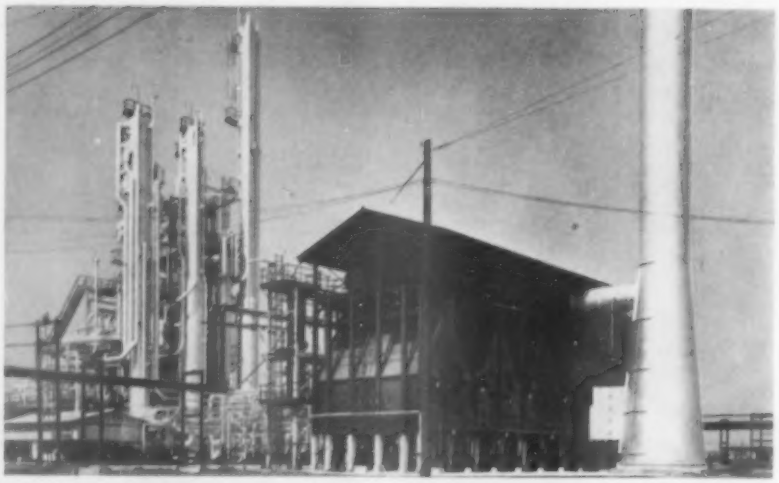
Auxiliary Purification

Purification would include the removal of sulfur, usually in the form of hydrogen sulfide or carbonyl sulfide; of water; of acetylene; and of carbon dioxide.

Sulfur compounds and carbon dioxide can be removed by means of conventional processes such as amine and caustic solutions in series. However, these scrubbing towers, although conventional in type, must be operated for far more complete removal than is usually required. Sulfur compounds and carbon dioxide are undesirable for some of the uses for which ethylene is consumed; therefore, considerable attention must be given to insure that they are removed to the low parts per million level.

Acetylene can be lowered to the desired level by two general procedures: one by hydrogenation, and the other by solvent extraction with one of the several solvents available for that purpose. Gulf employs the former method, and passes the cracking-heater effluent, which is rich in hydrogen, over a selective hydrogenation catalyst under closely controlled conditions.

Water removal critical . . . The most critical of all the auxiliary purification steps, however, is the removal of water. The feed to an ethylene-unit separation section must be dehydrated to a very low dew point. With the very low temperatures of the ethane-ethylene fractionator, or the demethanizer, virtually all water must be removed in order to prevent the formation of hydrates in the column. The removal of water, even to low dew points, is a well-known and well-understood operation, but its importance is such that too much drying capacity in an ethylene unit is highly unlikely. Moreover, one cannot be too careful in the operation of whatever drying equipment is available.



Gulf ethylene unit. Separation section is at left and production section in right foreground. A new expansion program under way will make this central ethylene-producing plant the world's largest.

Solid desiccant . . . Some efficient form of solid desiccant generally is employed in order to achieve the required dew point. Because this is, of necessity, a cyclic operation, anything which can be done to diminish the load on the solid-desiccant driers will simplify the operation of the plant. The first and obvious thing to do is to chill the feed for the purpose of eliminating the water at the closest practical approach to the point at which hydrates or ice would otherwise be formed.

Glycol dehydration . . . A fairly recent development is the di or triethylene-glycol dehydration unit which is widely used in the natural-gas industry. Gulf now has such a unit in operation on an ethylene unit, as a partial dehydrator which precedes the solid-desiccant driers. This unit consists of an absorber in which the gas stream which is to be dried is continuously contacted with triethylene glycol. The glycol absorbs sufficient water to lower the dew point of the gas 35° to 40° F. The rich glycol is charged to a stripper column from which the water is removed overhead, and the stripped glycol is returned to the absorber. Inasmuch as this is a continuous system, its operation is relatively simple. By this means the water load on the solid-desiccant driers is reduced more than 50 per cent.

One very effective method for water removal employed in some ethylene units (but not in those which Gulf operates) involves the same type of freezing-out procedure sometimes used for water and carbon dioxide removal in the feed-preparation section of liquid-oxygen plants.

One of the earliest of the separation methods practiced was chemical con-

version to a final product. This has been done, to a large extent, in the formation of ethyl alcohol via the familiar sulfuric acid extraction process.

Except for this or other chemical extraction processes, all ethylene separation systems employ three principal steps. These are the elimination of methane-and-lighter, the elimination of propylene-and-heavier, and the final splitting between ethane and ethylene.

Reboiled absorption . . . A widely used method for elimination of methane-and-lighter from the gas charge to the separation system is that which involves reboiled absorption. This is the principle employed in the separation system of Gulf's first ethylene unit. The process involves the passing of feed stock through a refrigerated column which employs an absorption oil and added reboiling. The bottom of this absorption column is provided with a stripping section which aids in the rejection of the methane and lighter constituents overhead. The fat absorption oil, with its content of ethylene and heavier, is then passed to succeeding fractionating columns for the separation of lean oil, ethylene, and the cracking-furnace recycle streams.

Low-temperature fractionation . . . A n alternate method of demethanization, and the one employed in Gulf's second ethylene unit, involves the use of a low-temperature fractionator. The gas charge is refrigerated to a low temperature at a pressure sufficiently high to condense in part the mixture which enters this column. From this tower methane and lighter is taken as an overhead product, and liquid methane is used as reflux. The bottoms product is passed to succeeding fractionating columns.

A modification of this low-temperature fractionation procedure which has been employed by some companies involves the use of the oxygen-plant fractionating technique. Charcoal absorption is another process which can be used to demethanize.

After the methane and lighter is removed, the ethane and ethylene can be taken overhead in a conventional tower, except that refrigeration is required in order to condense this overhead product. The deethanizer bottoms contain propylene and heavier materials. This bottoms product may be recycled to the cracking furnaces, but usually any C_4's-and-heavier present will first be separated out as a product stream. Many units recycle the total C_3 stream to extinction. But, because propylene itself is valuable and because it is a less desirable material for charge to cracking furnaces which produce ethylene, it is often removed before the propane is recycled.

Propylene present in the charge to the unit, or in the recycle propane stream, may be removed in conventional fractionating equipment. This separation is relatively difficult, however, particularly if high-purity propylene is required for other petrochemical operations. Another means of recovering the propylene, and the one used by Gulf, is to charge the whole propane-propylene recycle stream through a catalytic polymerization unit, and to recover it as high-octane motor gasoline and tetramer. The propane effluent is then a more desirable feed to the cracking furnaces.

The overhead from the deethanizer is charged to an ethane-ethylene splitter. The ethylene product is taken overhead, and the ethane bottoms are recycled to the cracking coils.

Heart of Plant Is Refrigeration

The separation of butane and *iso*-butane can be achieved in conventional fractionation equipment at regular cooling-water temperatures. Such is not the case, however, with the ethane-ethylene separation, inasmuch as these materials would be above their critical temperature if conventional cooling water were employed.

As a matter of fact, increasing the pressure is only a partial solution, because the separation of ethane and ethylene is pressure-sensitive in the sense that, at increasing pressures, the separating efficiency decreases sharply. In order to provide ethylene of high purity, it is necessary to fractionate at moderate pressures, and this requires refrigeration temperatures well down in the subzero °F. range.

Cascade refrigeration . . . This is required in order to obtain the low temperatures for the demethanization step in the processes used by Gulf, and this refrigeration may or may not be used in the ethane-ethylene separation. Here the low-level refrigerant is most generally ethane or ethylene. This, in turn, is condensed with the high-level refrigerant, usually propane, which is condensed with conventional cooling water. Cascade refrigeration is not at all new or novel, but the fact that each level of refrigeration must be in satisfactory operation before the next lower level of refrigeration can be brought on stream compounds the difficulties in operating equipment of this type.

Once again, however, the analogy between a conventional refining unit and an ethylene unit is a matter of "only more so." Not only does a column of an ethylene unit have to be in equilibrium so that it does not upset the operation of a succeeding column, but the reflux for some of these columns cannot be obtained unless the cascade refrigeration is operating properly. Inasmuch as any ethane or ethylene used for refrigeration very probably is produced within the ethylene unit, and inasmuch as this refrigerant must be relatively pure in order to provide the control necessary in the refrigeration system, the operation of an ethylene-separation unit is a kind of "lifting by the bootstrap" operation. It is no longer a simple matter of trying to operate a group of towers in series, with each column feeding the one following. The refrigeration systems are probably interlocked, and they compound the operating problem.

In the design of an ethylene unit there is a great deal of temptation to save equipment by the interlocking of operations through a number of internal recycle streams. Often equipment is saved; and it is true that equipment saved is equipment which doesn't have to be operated. However, some of these simplifications can complicate the operation of the unit more than the equipment elimination can simplify it. This is particularly true during startup, because then the operator is seldom blessed with recycle streams and, especially, refrigerants of equilibrium purity.

Centrifugal compressors . . . Such variations from normal conditions are particularly important in a plant which uses centrifugal compressors. Such machines, by their general character, are very critical to changes in gas density. Like a centrifugal pump, each impeller increases pressure by so many feet of head of the fluid handled. But, unlike a pump, the density of the fluid changes through each impeller. Thus any change in density at the suction is amplified at each stage and may end up as a discharge pressure very different, in pounds per square inch, from that of the design. This discharge pressure cannot be compensated for by changes in quantity, as in the case of the reciprocating machine, because the head-vs.-quantity curves of most of these machines are very flat. Thus the limits of variations, as well as the normal operating point, must be considered in the design of such a unit.

Operation of Cracking Furnaces

The dehydrogenation of ethane or the cracking of propane so as to produce ethylene is, in Gulf's units and many others, achieved in a tubular coil. The tubes are fired on the outside, and the feed stock plus steam pass through the inside. The conventional thermal cracker employs a furnace whose coil

outlet temperature seldom exceeds 1,000° F. Once again the comparison with an ethylene unit is a matter of "only more so." Here the coil outlet temperature is some 500° F. higher than that of the conventional thermal cracker. This is possible only because the feed stock is extremely clean. Although the clean feed stocks minimize many problems, the metals problems associated with the higher tube-metal temperatures are still there.

High-alloy tubes . . . In order to operate cracking furnaces with tube-metal temperatures above 1,500° F. it is necessary to use high-alloy tubes. All tubes in this service, so far as we know, contain nickel. In Gulf's furnaces 18-8 stainless-steel tubes are used in the lower-temperature section of the furnaces. In the higher-temperature sections we have Inconel, Incoloy, and 25-20 stainless steel. Some information has been published on the relative tube life which is to be expected from some of these alloys. In our operations we feel that it will take several more years to evaluate properly these different alloys, or even to say whether or not the cost of the higher alloys is justified over 18-8.

A few established facts regarding tube life which we have confirmed are:

1. Welding must be perfect.
2. Increased coking shortens tube life.
3. None of these alloys is satisfactorily self-supporting at these temperatures for distances in excess of approximately 4 ft.

Minimizing coking . . . There are probably as many ideas on how to minimize coking as there are operators of thermal cracking equipment. The principles, however, are the same for both the conventional thermal cracker, or thermal reformer, and the ethylene-producing unit. These are to keep the mass transfer up, to keep the feed clean, to maintain proper temperature gradient, and to keep charge and firing rate constant. Provision for a quenching system which is rapid and effective is essential. With much higher temperatures, much lighter materials, a substantial amount of hydrogen in the effluent stream, and no liquid condensation to aid heat transfer, the problem of quenching once again becomes a matter of "only more so."

Problem of Coke in the Heaters

The matter of coking involves the problem of reaching a proper compromise between the elimination of coke formation and the achievement of the benefits from the higher temperatures and other conditions of higher feed-stock conversion which tend to aggravate coke formation. We do not believe that it is economically feasible to try to eliminate coking entirely. Rather, we believe that the proper solution to the whole problem is a matter of learning how to live with coke formation, and then learning how to take such steps as are necessary to minimize the interference with operations which coke formation might otherwise cause.

Extra heaters . . . We think that one of the best means of solving the coking problem in an ethylene unit is to provide extra heaters, or sufficient extra heater capacity, so that heaters may be removed from service without decrease in the capacity of the unit. Thus we have found that the proper solution to our problem is a matter of extra furnace capacity and a means of decoking the offstream heater rapidly, without the necessity of pulling it apart.

Steam diluent . . . The use of a diluent such as steam in the cracking-heater tubes serves another very important purpose, totally apart from its usefulness in suppressing coke formation. Because ethylene heaters must come down at regular intervals for coke removal or repairs, the unit is most properly made up of a number of relatively small cracking furnaces. To bring these furnaces down without effecting a substantial change in the throughput of the plant requires that fresh furnaces be brought onto the line. This is generally best achieved by bringing them up to temperature with steam passing through the tubes, and with sufficient fire in the box to achieve the necessary temperatures. Once the furnace is in approximate equilibrium, feed stock can be cut from the furnace which is being taken out of service and put into the furnace which is being placed in service, with a minimum of upset to the separation section of the plant.

The operation of the furnaces and other parts of the ethylene unit requires that a great deal of mechanical work be done on the units while they are in operation, or at least while other sections of the plant continue to operate. This means that the unit should be so constructed, and so laid out, as to permit the necessary welding and other types of maintenance work to proceed even though the unit itself remains in operation.

Removal of Water

Almost everyone who has operated a variety of fractionating equipment has, at one time or another, had difficulty because of the presence of water in the fractionator. In the case of an ethylene unit, the presence of water is once again a case of "only more so." Here the temperatures are sufficiently low, and the pressures sufficiently high, that any water present will form hydrates with the hydrocarbons, and these hydrates will accumulate so as to produce an ice plug which may render the column incapable of passing its required vapor or liquid load. Methanol is used as a means of minimizing hydrate formation, if the means of getting the methanol to the proper place in the column is available. Methanol is, at best, only an emergency answer to the problem, however; complete feed dehydration is the most desirable solution.

The problem of water removal has so important a bearing on the operation of an ethylene plant that the customary procedure of steaming out for removal of hydrocarbons is not satisfactory when it comes to the starting up or shutting down of an ethylene unit. Although the steaming-out process will achieve the purging desired, the water introduced into the unit prolongs the drying-out time necessary when the equipment is started up. This, coupled with the necessity for starting a number of columns in series and for obtaining refrigerant to get the system into equilibrium, complicates matters unnecessarily. We have found it a desirable solution to install an inert-gas generator which is equipped with driers capable of providing a low-dew-point inert gas for purging.

It is also apparent that the existence of sufficient accumulator capacity to permit storage of enough internal recycle streams of equilibrium composition is a substantial aid to the starting up of the unit after it has come down for a temporary shutdown or for minor repairs.

Gulf delivers ethylene from producing units to consumers via a pipeline system which it has installed, and which serves not only Port Arthur, but also the Orange, Houston, and Texas City, Tex., areas. The operation of this pipeline is once again a matter of "only more so."

Both operations and maintenance of the ethylene pipeline are handled by Gulf's pipeline department. Coordination and operational control of the line rest with the 24-hour per day dispatching center in Gulf's Houston pipeline offices. Private-line telephone service is available from this center to each customer or Gulf facility which has a metering station handling ethylene.

Reference

1. Cornell, P. W., The Oil and Gas Journal, August 17, 1953, page 111.
2. Kilpatrick, M. O., et al., The Oil and Gas Journal, May 10, 1954, page 162.

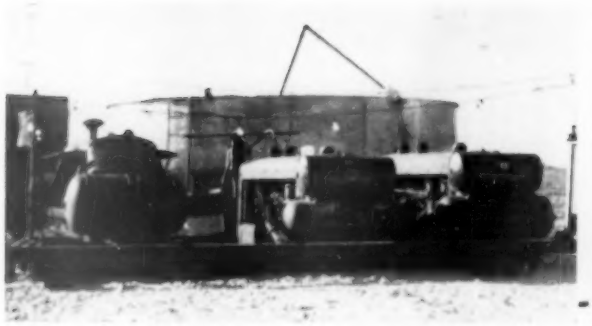


Fig. 1—Two 315-cu.-ft. and one 210-cu.-ft. compressors furnished air for drilling and coring.

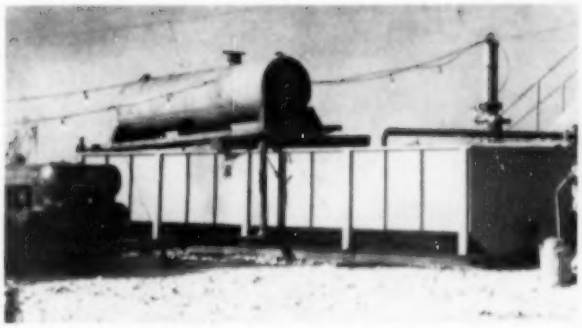


Fig. 2—This aftercooler was installed between compressors and standpipe.

Slim Holes Drilled With Air . . .

- *to get faster penetration*
- *improved bit life*
- *better cores*

A RECENTLY completed water-injection well in Lea County, New Mexico, was drilled and cored with air to more than 3,600 ft. in small-diameter hole. Primary objective of air drilling this well was to secure dry cores for reservoir analysis, but penetration rates and bit life were also improved over conventionally drilled wells in the area.

Humble Oil & Refining Co., operator of the well, reports that drilling and coring with air was satisfactory in this well and that the technique has possible applications in several other areas.

Humble's New Mexico State H-7, as it is called, used water for the 1,195 ft. of 8¾-in. surface hole. Then, during time of waiting on cement, air-drilling equipment was installed. Originally, two 315-cu.-ft. and one 210-cu.-ft. compressors were installed, as shown in Fig. 1. However, due to mechanical difficulties, a third 315-cu.-ft. compressor was later added for standby.

Fig. 2 shows the air aftercooler which was installed between the compressors and the standpipe. This aftercooler consists of four passes of 6-in. casing approximately 8 ft. long. When air drilling started, a metal rotary hose was used. However, due to the low temperatures involved, it was necessary to use a conventional rotary hose below 2,790 ft.

Cuttings were discharged through 150 ft. of 6⅝-in. casing, as seen in Fig. 3. A screen was placed over the end of the discharge pipe as a protection against fire.

Bit program . . . Two air-type 5⅝-in. bits were used to drill from the surface casing seat at 1,195 to 3,400 ft. The first was run in the hole at 1,195 ft. and drilled to 2,191 ft. in 35.1 rotating hours. The second bit was used from 2,191 to 3,400 ft. Both bits were in good condition when pulled.

Fig. 3—Cuttings discharge. Cores recovered were dry and relatively uncontaminated.

These bits averaged 1,103 ft., and had an average penetration rate of 24.7 ft. per hour, compared to 237 ft. per bit and an average penetration rate of 16.6 ft. per hour, over the same interval for 13 other wells drilled in the same area.

The volume of free air varied from 575 to 600 cu. ft. per minute at an average pressure of 105 psi., while drilling the 5⅝-in. hole.

Five Cores Cut

Five 5⅝-in. cores were cut from 3,400 to 3,580 ft. with an average recovery of 54 per cent. The average penetration rate while coring the 5⅝-in. hole was 8.2 minutes per foot with 430 cu. ft. of free air at 130 psi.

Four and one-half inch casing was set at 3,580 ft., and cemented with 90 sacks of 8 per cent jel cement. Thirty barrels of drilling mud were spotted ahead of the cement and no difficulties were encountered while running and cementing casing. Top of the cement was found 395 ft. from the surface.

After drilling the cement plug and 31 ft. of new hole below the casing seat, coring was again resumed in a 3⅞-in. hole. Two cores were cut with air from 3,611 to 3,664 ft., and full recovery was obtained. The average penetration rate obtained while coring the 3⅞-in. hole was 9.4 minutes per foot with 115 cu. ft. of free air at an average pressure of 140 psi.

Oil entry into the hole made it difficult to dry up the well bore, and the hole was cored with water from 3,664 ft. to a total depth of 3,693 ft.

It's a matter of integration . . .

Fitting Sulfur Recovery Into Gasoline Plants

Here's a study of the economic picture for small units

by R. A. Graff

CURRENT design practices have made it a must to include sulfur-recovery facilities for gasoline plants to be operated in sour-gas areas.

In the not-too-distant past, the gasoline-plant operator was usually only concerned with the manufacture and marketing of gasoline products. More recently, his operations have been complicated by the recovery and sale of L.P.G. products. And it now appears that the plant operator is scheduled to become a full-fledged petrochemical manufacturer.

Hydrogen sulfide, available as a by-product from a gas-desulfurization operation, provides a convenient raw material for the economical manufacture of elemental sulfur in relatively small quantities. Plants capable of producing as little as 5 long tons pe. day are now in operation, and the upper size limit has not been established.

Integration necessary . . . For the smaller-size sulfur-recovery plants, in the capacity range of 5 to 30 long tons per day, the secret of economical operation involves the design of a unit that will operate on a minimum of labor and will be integrated in operation with the several other process units in the gasoline-plant area.

Author is associated with Graff Engineering Co., Dallas.

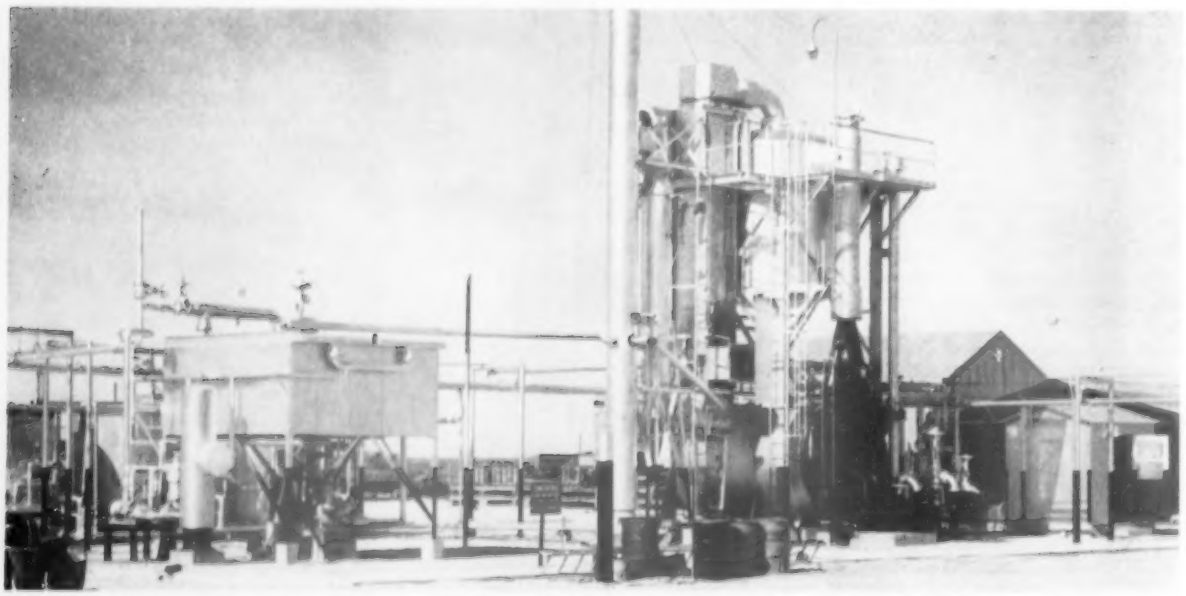
The sulfur-recovery operation involves the partial oxidation of hydrogen sulfide with air to produce elemental sulfur and water vapor. In addition to the sulfur produced, there is available approximately 2 lb. of high-pressure steam per pound of sulfur produced. The operation is therefore self-sustaining from a power-requirement standpoint.

By integrating the sulfur-recovery unit operation with remainder of gasoline-plant operation, a saving in initial investment can be made in relation to the steam-generation facilities for the gasoline plant. In the case of the sulfur plant, common use of water-treating facilities, boiler-feed-water pumps, and the return-condensate system results in an appreciable saving in initial expense for the sulfur-recovery unit as compared to an installation involving an independently operated sulfur plant.

Current practice . . . It is standard practice to utilize the byproduct high-pressure steam from the sulfur unit to operate a steam-driven combination air blower with the exhaust steam being condensed at the gas-purification-unit reboiler. Purchased or generated electric power is usually used for the operation of sulfur loading and circulating pumps.

Labor requirements for units in the nominal size range of 5 to 30 long tons per day are only of a casual nature. One major oil company which operates a 20-ton per day unit charges off 3 man-hours of operating labor per day against this unit.

It is more or less standard practice to locate the sulfur-recovery unit in the plant boilerhouse area, and the boiler-plant operator is usually responsible for the sulfur-plant operation. This choice of location is dictated by the fact that the major item of equipment



THIS SULFUR-RECOVERY unit is integrated into the Sid Richardson Gasoline Co. gasoline plant at Kermit, Tex.

in the sulfur plant is the heat-recovery boiler, which is usually part of the high-pressure steam-boiler system.

For reasons of economy, along with the fact that an emergency shutdown of the sulfur-recovery unit will not affect the balance of the plant operations, a spare sulfur-recovery-unit boiler is not required. To minimize down time for this steam boiler, it is the accepted practice to feed this boiler from a supply of steam condensate, such as the reboiler of the amine-gas desulfurization unit, thus eliminating the necessity of periodic boiler blowdown and cleaning.

Market survey . . . The economics of sulfur-plant operations are such that a market survey should be made in the early planning stages of the sulfur-recovery unit. Favorable marketing conditions for sulfur involves the local sale to an insecticide or fertilizer manufacturer, in which case the sale price can be based on the Gulf Coast price plus inland freight.

In cases where no market is available in the immediate vicinity, the sale price is usually the same as the Gulf Coast price. But in any case the Gulf Coast price plus inland freight to the consumer will govern the sale price.

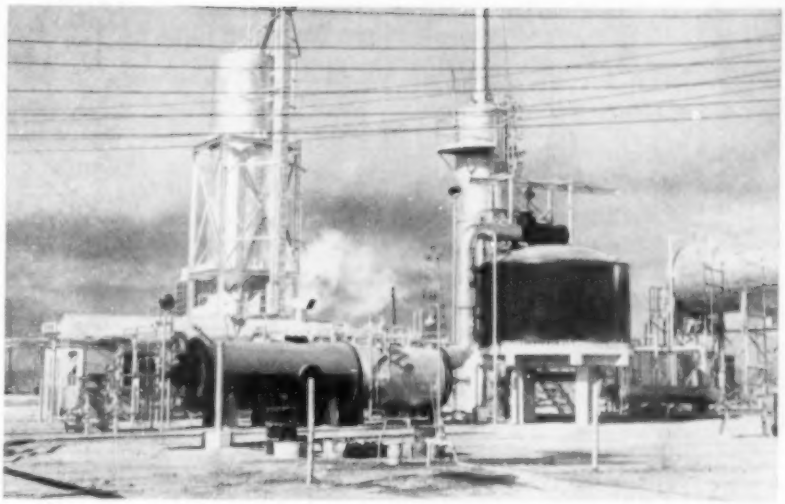
As a guide for locating a satisfactory market, the approximate consumption of sulfur by the various industries is listed below:

Industry—	Per cent of total
Fertilizer	35
Chemicals	19
Paper	8
Steel	8
Petroleum	3
All other industries	27

Handling sulfur . . . The preferred method of handling sulfur is in the molten-liquid state. In the Southwest, it is the practice to transport sulfur in trailer tank trucks either to the consumer or to the nearest rail shipping point. At other locations, where a railroad siding is located adjacent to the plant site, either sulfur is loaded into tank cars in liquid form or it is loaded into boxcars in flake or lump form.

In a case where it is not feasible to transport liquid sulfur, solidification into flake form can be readily carried out by means of a water-cooled flaking drum. The final product then can be stored in bins or elevated tanks prior to shipment.

The production of large blocks of sulfur formed on the ground is usually carried out at locations where no ready market is available. In such cases, the sulfur is mechanically broken from the block and loaded at intervals when market or weather conditions are favorable. Unlike Frasch-mined sulfur, sulfur recovered from hydrogen sulfide solidifies into a loose crystal arrangement that can be crushed and handled with a dragline or similar loading device.



SULFUR PLANT at Sid Richardson-Odessa Natural Gasoline Co. natural-gasoline plant at Odessa.

Of all the methods considered, the handling of sulfur in the liquid state involves the least expense to the producer and the consumer. So this method should be given as much consideration as possible.

Heat recovery . . . While the major portion of the heat produced as a by-product of the sulfur-recovery operation is available as high-pressure steam, it is also possible to recover additional heat in the form of low-pressure steam at the sulfur condensers. Here the quantity of low-pressure steam available amounts to about 1 additional pound of 15-psig. steam per pound of sulfur produced.

In some instances, it is not desirable to recover this heat, in which case it can be removed by cooling a recirculating stream of liquid-sulfur coolant in the process. The cooling of a recirculating sulfur stream may be accomplished in shell-and-tube equipment, or it may be cooled by the addition of steam condensate to the system.

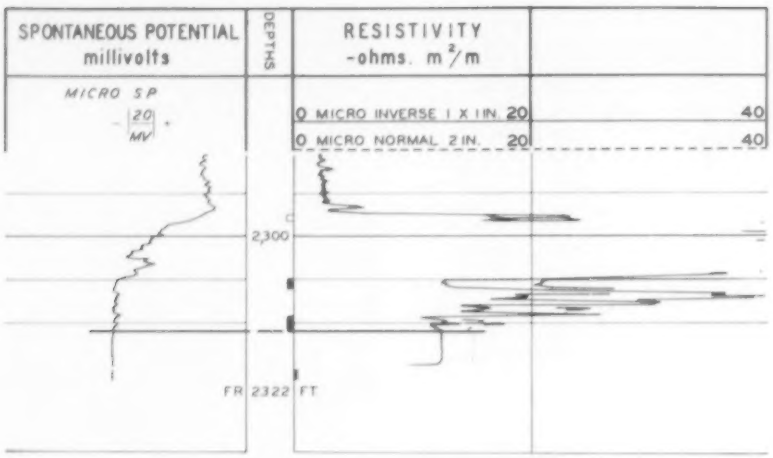
In cases where shell-and-tube equipment is used for cooling liquid sulfur, returned cooling water from the gasoline plant may be used for this purpose. Inlet-water temperatures in the range of 100° to 150° F. are satisfactory for this service. However, corrosion on the water side of the shell-and-tube equipment may limit the temperature rise in the cooling equipment. Very little additional load is placed on the cooling tower due to sulfur-plant operations since the cooling tower has a greater capacity when handling water at a higher temperature.

Sulfur economics . . . The economic picture for small sulfur-recovery units will vary with the plant location and the actual amount of sulfur produced. However, for a unit in the size range of 15 long tons per day of liquid sulfur, the total cost of manufacture will be approximately $8 per ton plus any processing taxes. Approximately one-half of the total cost of manufacture will be direct operating expenses, while the balance will cover amortization, taxes, insurance, and other fixed charges.

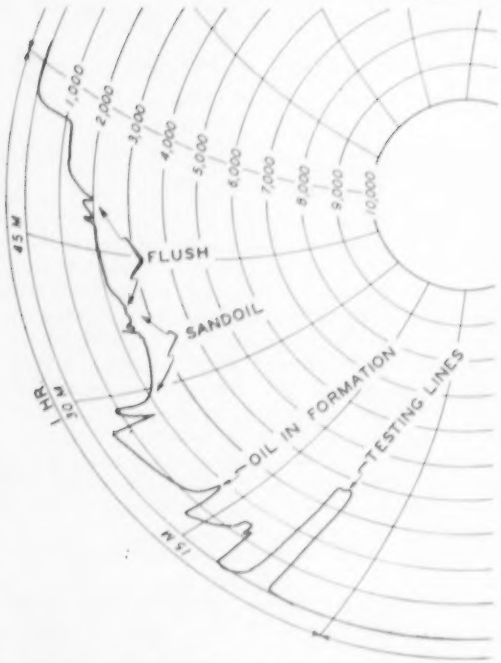
The average investment involved for a 15-long-ton per day two-stage integrated sulfur-recovery unit operated in conjunction with a gasoline plant would be approximately $125,000. Assuming favorable marketing conditions, this type of unit can be paid out in 2 to 3 years.

Instrumentation and mechanical equipment for the sulfur-recovery plant are substantially the same as for the gasoline plant, with the exception of specialized air blowers and sulfur pumps. The average gasoline-plant maintenance man will have no difficulty in servicing the sulfur-recovery unit. Specialized refractory-maintenance work is sometimes required, and this type of work is usually taken care of by employing a contractor that has specialized in this type of work.

Consideration is often given to the initial design of the sulfur-recovery unit so that the same size boiler and heat-exchanger tubes are duplicated between the sulfur unit and the gasoline plant, thus minimizing the quantity of maintenance supplies required.



ELECTRICAL-LOG SECTION on producing interval of experimental well. Fig. 1.



PRESSURE-TIME CHART on fractured limestone well. Fig. 2.

A TEXAS EXPERIMENT

Light Crude Oil Successfully Fractures Massive Limestone

by Monroe G. Cheney

FRACTURING of limestone reservoirs hydraulically with oil, followed by sand as a propping agent seems to have received little attention in the literature, despite the many successes and descriptions of this treatment of sandstone reservoirs. In this experiment light crude oil was successfully used to fracture a 15½ ft. sucrosic section of limestone at 1,500-psi. pressure; fuel oil was used to displace 1,300 lb. of sand into the created fractures at 2,300-ft. depth.

When Anzac Oil Corp. et al. cut the Marble Falls limestone in its 1 Brewer, A. Williams Survey 655, in eastern Coleman County, Texas, the 3½-in. by 29-ft. diamond core (Table 1) and MicroLog (Fig. 1) had 4 ft. of relatively soft top lime underlain by 13 ft. of hard massive limestone cap rock underlain by 15 ft. of limestone including 9 ft. of productive formation, as reported by core analysis.

The core top (2,296-2,309½ ft.), of hard, dense, generally fossiliferous gray limestone, contained a few fine vertical fractures slowly bleeding yellow oil. Possibly there was one thin shale break at about 2,300 ft. Black carbonaceous patches filled possible stylolite lines 2,305-09½ ft. A few stylolites were in the interval 2,315-17 ft. Irregular patches of chert were at 2,317-18 ft. and large streaks occurred at 2,323-25 ft.

The productive sections ranged 2,310-25 ft. (T.D.), and were in two parts, 2 and 7 ft. thick. The better parts were composed of small randomly oriented calcite crystals that at a short distance looked like coarse oil-stained sand. The average porosity of productive zones was 12.9 per cent, but, like the cap rock, their permeabilities were less than 0.1 md. A little porosity could be seen with the hand lens; the average residual oil saturation of 29.1 per cent of pore space was evident by odor and stained patches. There were a few white, vertical seams of larger and apparently barren crystals.

Numerous previous attempts at improving Marble Falls lime production in this area with acid and explosives had in general proved to be unsatisfactory. A gel-acid treatment, following 10,000 gal. of acid, had been taken

Author is with Anzac Oil Corp., Coleman, Tex.

It Pays...

...to put the shots where they count!

McCULLOUGH M-3 BULLET GUN
and **GLASS JET *PERFORATORS***

Simultaneous firing (holes in the casing exactly as in the gun itself), exact measurements, multiple zone shooting, burrless bullets, and up to 50% deeper penetration. Write for your copy of "HOW TO GET MORE OIL."

McCullough
TOOL COMPANY
LOS ANGELES • HOUSTON • EDMONTON
OVER 40 OIL FIELD SERVICE BRANCHES
SERVICE ANYWHERE—ANYTIME

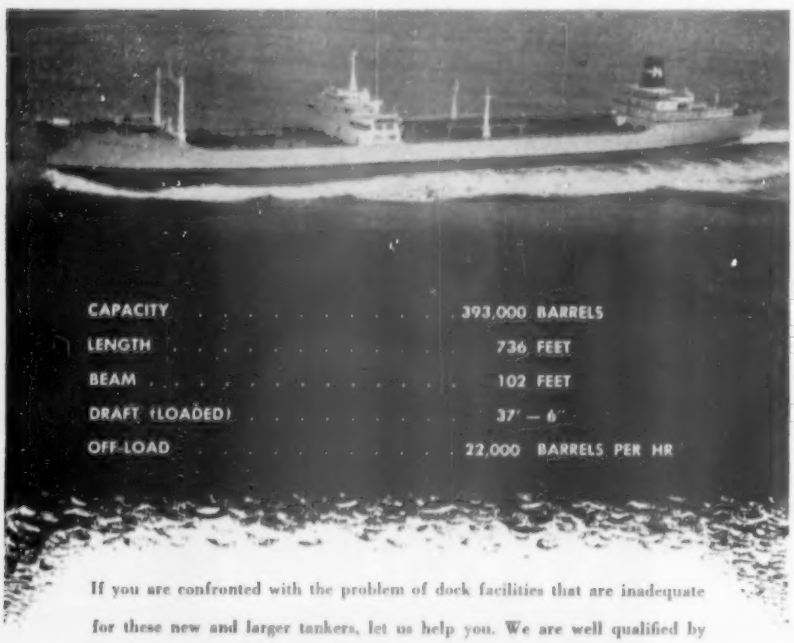
FOR BEST RESULTS LOG AND PERFORATE BY McCULLOUGH

TABLE 1—CORE ANALYSIS

Sample number	Depth ft.	Permeability md.	Porosity per cent	Residual saturation oil % volume	Residual saturation oil % pore	Residual saturation total water % pore
1	2309.7	0.1	5.2	0.0	0.0	59.6
2	10.5	0.1	11.4	3.0	26.3	31.6
3	11.5	0.1	10.7	2.7	25.2	27.1
4	12.5	0.1	6.8	1.4	20.6	35.5
5	13.5	0.1	3.3	0.5	15.2	36.4
6	14.5	0.1	6.0	0.5	8.3	33.4
7	15.5	0.1	7.2	0.9	12.5	59.8
8	16.5	0.1	10.0	3.0	30.0	34.0
9	17.5	0.1	10.7	3.2	29.9	35.5
10	18.5	0.1	15.2	4.4	28.9	42.1
11	19.5	0.1	11.8	3.5	29.7	34.7
12	20.5	0.1	20.3	7.1	35.0	36.9
13	21.5	0.1	12.0	3.3	27.5	38.3
14	22.5	0.1	14.1	4.1	29.1	40.4
15	23.5	0.1	8.4	1.2	14.3	40.5
16	24.5	0.1	9.4	2.1	22.4	36.2

COULD *YOUR DOCKS* HANDLE THIS *SUPER-SUPER* TANKER?

"World Glory", the new 45,000 ton tanker built by Bethlehem at its Quincy yards.



If you are confronted with the problem of dock facilities that are inadequate for these new and larger tankers, let us help you. We are well qualified by 52 years of world-wide experience in the engineering and construction of harbors, docks and terminals.

FREDERICK SNARE CORPORATION

233 BROADWAY NEW YORK 7, N. Y.

HAVANA · SAN JUAN · CARACAS · BOGOTA · LIMA · GUAYAQUIL

on a vacuum in one well. Anzac had decided to try to hydraulically fracture with light crude oil.

After coring, the rathole was drilled out to full 8¾-in. diameter and electrically logged. The 5½-in. casing was run to 15½ ft. off bottom (through the cap rock) and set with 40 sacks of cement. Four days later the hole was cleaned out and one 55-gal. drum of 15 per cent hydrochloric acid—sufficient to fill the open hole—was left on the lime[1] overnight. Following cleaning, a second barrel of this acid was left on the lime for 2 hours.[2] With the cleaned hole left overnight, the well filled 60 ft. with oil. In preparation for fracturing, a retrievable packer was run on 2⅜-in. upset tubing and annulus and tubing were loaded with crude oil (42° A.P.I.).

The injection equipment was pressure tested to 3,500 psi. and crude oil was injected down the tubing. The formation broke readily at 1,500 psi. (Fig. 2). In fracturing and extending the fractures, 95 bbl. was used. Then No. 5 fuel oil, bearing ½ lb. of sand, was introduced; when this went in satisfactorily the sand load was increased to 1½ lb. per gal. and the maximum recorded pressure was 2,300 psi. The 45 bbl. of fuel oil entrained 1,300 lb. of sand (20-40 mesh) into the tubing, and these were followed by 60 bbl. of the light crude oil.

Subsequent pulling of the tubing disclosed 25 lb. of sand in the bottom of the hole. The oil produced from the formation carried water and required swabbing, although the first 165 bbl. (200 injected) of oil flowed back in 6 hours. A little more sand could be heard rattling in the lines, while the oil was flowing into the tank. On production this well followed the same lines of rapid decline generally experienced elsewhere in the field after numerous trials with acidizing and/or shooting. At first it looked as though it might make 100 bbl. of oil and 50 of water per day, but after 2 months, production leveled off to 6 bbl. of oil and a little water.

It is concluded that fracturing of this thick unfractured sucrosic-crystalline low-permeability limestone with light crude oil could be done readily in the same manner as low-permeability sand, at least if preceded with a very light treatment of acid. Probably the acid[3] is not necessary as Billings[4] cites the tensile strength of limestone to be at most twice that of sandstone.

References

1. Dowell Incorporated, (Coleman office), reported solubilities ranging from 83.7 to 88.7 per cent.

2. Quantity of acid was sacrificed for speed of reaction.

3. The acid was introduced in hopes that it would dissolve the finer calcite crystals, allowing greater penetration of the fracturing fluid as Howard & Bearden (Howard, G. C. & Bearden, W. G., "9,360 Wells Undergo Hydraulic Fracturing," *The Oil and Gas Journal, September 1, 1952,* Fig. 1) indicate rapidly declining formation breakdown pressures for an increasing distance of fracturing-fluid penetration prior to fracture. For instance, they report that if the breakdown pressure were 2,800 psi., with ½ in. of fluid penetration, then a penetration of 2 in. would require a breakdown pressure of only 300 psi. This curve is assuming horizontal fracturing of which there is considerable doubt (McQuire, Harrison & Kieschnick, "Mechanics of Formation Fracture Induction & Extension," A.I.M.E. Petroleum Branch, October meeting, Dallas, Paper 318C).

4. Billings, M. P. Structural Geology Prentice-Hall, New York, 1950, Table 1, p. 19.

Authors note: This experiment was performed with the aid of Halliburton Oil Well Cementing Co., Coleman branch office, Coleman, Tex., to whom we are indebted for advice, equipment, and successful operation. The electric logging was done by Schlumberger Well Surveying Corp., whose Coleman personnel also lent assistance on this report.

Fracturing Ups Production In Acid-Soluble Formations By 200 Per Cent

by George C. Howard

THE version of hydraulic fracturing designed for use in acid-soluble formations has been applied in an estimated 3,300 wells as of March 1, 1954. Of these wells, 65 per cent have shown sustained production increases, a typical treatment resulting in a 200 per cent increase in oil-producing capacity.

In this process for carbonate rocks the first step, formation breakdown or fracturing, is accomplished by injecting a thickened acid into the formation at a pressure sufficiently high to cause fracturing. The thickened acid fracturing fluid is prepared by the addition of a suitable thickening agent to hydrocholoric acid.

In this manner, a treating fluid is obtained which is not only capable of fracturing the formation, but is also capable of enlarging the fracture formed by the reaction between the acid and acid-soluble formation.

The viscosity reduction of this fluid results from either the reaction of the thickened acid with the carbonate rock or by hydrolysis of the thickening agent by the acid and, for this reason, no separate gel breaker is necessary. That is, the viscosity of the thickened acid will reduce to that of spent acid within a few hours after contact with a carbonate formation.

As stated above, it is not necessary to inject a separate gel-breaker solution following the fracturing operation; however, if additional acidization of the zone is desired, plain acid may be injected into the formation following the fracturing fluid. However, it should be pointed out that this is not an essential part of the process.

The third step of this method consists merely of placing the well on production to flush out the treating fluids.

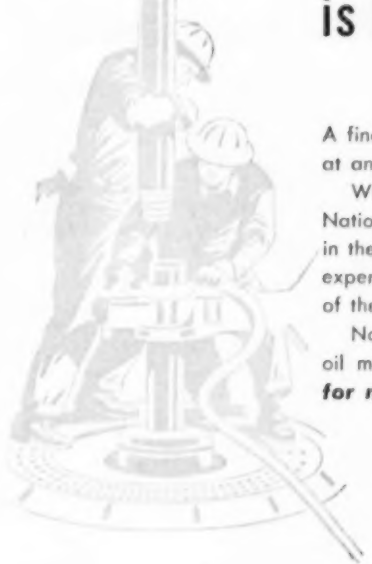
This version of the hydraulic fracturing process was designed for use in acid-soluble or carbonate formations. As with other hydraulic fracturing methods, this method has been found applicable to both newly drilled wells and old wells requiring production stimulation.

Author is with Stanolind Oil & Gas Co., Tulsa. From a paper presented at 1954 Gas Supply, Transmission and Storage Conference of American Gas Association, New Orleans.

every
step
of the
way...

the oil bank of Denver

is here to help you



A financial problem may present itself at any time in your petroleum operation.

When this happens, call on the U. S. National Bank for assistance. Our specialists in the Oil and Gas Departments are experts at solving the financial problems of the oil and gas industry.

No wonder so many Rocky Mountain oil men are saying: ***"That's the bank for my money!"***

UNITED STATES NATIONAL BANK

US 239 17TH AND STOUT STREETS • DENVER

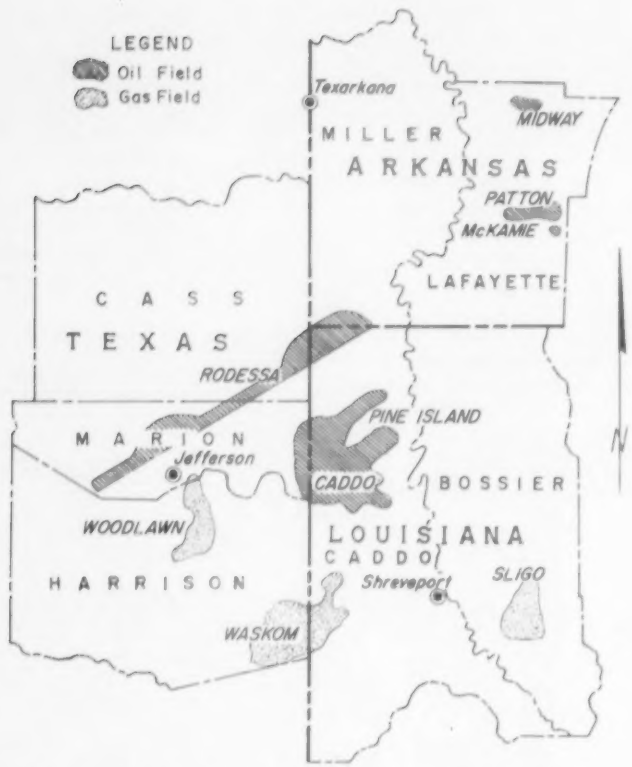


Fig. 1—Sketch map showing location of Caddo-Pine Island field.

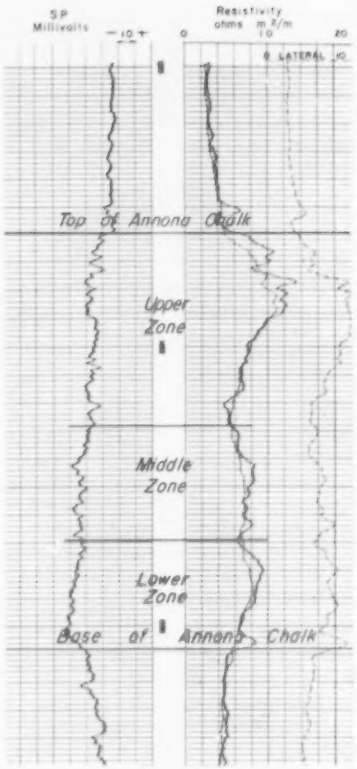


Fig. 2—Typical electric log of Annona chalk in field.

Fracturing Rejuvenates a Veteran Field

by Wayne L. McCann

FOLLOWING discovery of Caddo field in 1905, some 7,500 wells had been drilled in the 48 years ended January 1, 1953, in the Greater Caddo area (which also includes Hosston, Pine Island, Mooringsport, and Vivian fields) (see Fig. 1). A.I.M.E. statistics credit the field with a recovery of 191 million barrels of oil through 1952. In the past 6 months, however, there have been 514 new wells completed in this old stripper area; 87 per cent, or 447 of the new wells were efforts to establish production in the Annona chalk. Only about 2 per cent of the chalk tests were completed as dry holes.

The Caddo area produces from numerous sand and limestone reservoirs of both Upper and Lower Cretaceous age.

Annona chalk reservoir . . . The Annona chalk, or "chalk rock" as it is frequently called, is found at an average depth of 1,400 ft. in the productive portion of the field. It is composed of chalk and shaly chalk through an interval of 150 ft. (see Fig. 2). The Annona chalk is Upper Cretaceous in age, and is a blanket formation covering the Ark-La-Tex area.

Principal area of present chalk production embraces 20,000 acres. In addition to the main area there are other chalk productive areas nearby; these are, however, relatively minor in areal extent.

Porosity of the chalk will average 25 to 28 per cent, but permeability is uniformly low, being on the order of 1 md.

Gravity of the crude oil found in the chalk ranges from 29° to 43° A.P.I. depending on location, but will ordinarily average 38° to 40°. This crude has a ready market because of its high gasoline content. Present per well allowable is 56 bbl., but a well which will produce this much oil for as long as 2 or 3 months is the exception rather than the rule.

Production related to fractures . . . It is theorized that the hydrocarbons now present in the chalk have migrated there from lower formations through the numerous fractures and "crevices" associated with the faulting of the Caddo-Pine Island uplift.

Previous to 1953 commercial production was obtained only in those parts of the field where fractures and crevices are relatively numerous. Attempts to stimulate productivity by various types of acid treatments met with only moderate success. In January 1953, two of the larger operators independently undertook experiments involving fracturing with heavy oil mixed with sand for a propping agent. The success of these experiments has led to a marked revival of drilling and workover operations. In March 1954, for example, 71 or 26 per cent, of the 273 new wells completed in Louisiana were Caddo-Pine Island chalk wells.

Several major oil companies are currently active in the chalk development. In addition there are a large number of independent operators who have drilled from 1 to 10 or more wells each

PRECISION FITTINGS

for the Oil Industry

Regular Swaged Nipples and Bull Plugs — Special Refinery Alloy Swaged Nipples and Bull Plugs — Seamless Casing Nipples — Seamless Steel Tubing Couplings & Subs — Seamless Sub-Tubing Nipples (Pup Joints) — Perforated Tubing Nipples — Adaptor Nipples — Boiler Nipples — Choke Nipples.

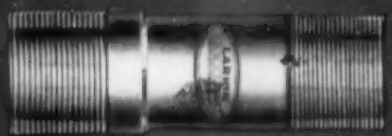
LARKIN PACKER CO., INC.

St. Louis, Mo.

LARKIN

Available Everywhere

...Through Your Supply Store



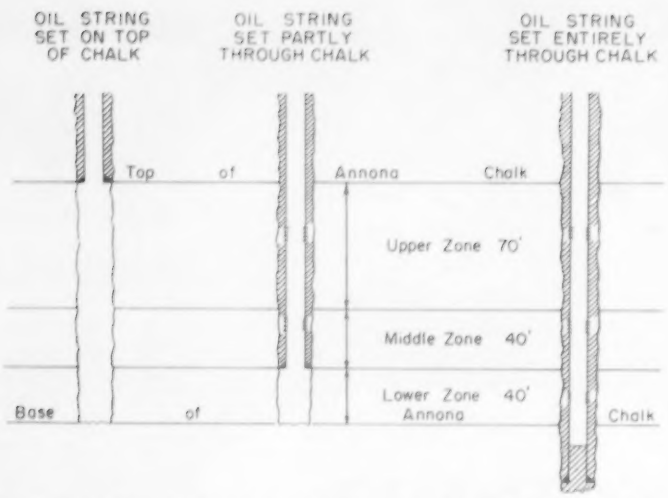

OIL STRING SET ON TOP OF CHALK
OIL STRING SET PARTLY THROUGH CHALK
OIL STRING SET ENTIRELY THROUGH CHALK
Top of Annona Chalk
Upper Zone 70'
Middle Zone 40'
Lower Zone 40'
Base of Annona Chalk

Fig. 3—Sketch showing three principal completion methods in the Annona chalk in Caddo-Pine Island field.

during the past year. Most of the older chalk leases have had additional wells drilled recently, with no apparent effect on the production from the older wells. The opinion is fairly general that the typical chalk well, even after fracturing, is capable of draining only a few acres at best. This fact, together with the flush-production characteristics of the fractured wells, absence of spacing rules, relatively inexpensive drilling and completion costs, and presence of town-lot subdivisions have all resulted in the active drilling campaign presently being experienced.

Drilling and Completion Methods

From 60 to 100 ft. of 8⅝-in. surface casing is usually set, although recently some operators have dispensed with surface casing by cementing the oil string to the surface. Ordinarily the oil-string hole is drilled with one bit, and no coring is done except in occasional outpost wells. Drilling time and nearby subsurface control are adequate to permit stopping the hole at the desired point. Conventional electric log is run before running casing and/or radioactivity log is run after the hole is cased. Sidewall cores and drill-stem tests are seldom if ever taken in the chalk section.

Completion methods may be grouped into three classifications, as follows: (1) Oil string set on top of chalk; (2) oil string set part way through chalk; and (3) oil string set entirely through chalk (see Fig. 3).

Oil string set on top . . . Either 4½ or 5½-in. o.d. casing is ordinarily run to the top of the chalk and cemented with common portland cement. After waiting on cement 24 to 48 hours, the plug is drilled, hole is washed to bottom, and mud is displaced with either clear water or crude oil. Fracturing is accomplished with from 15,000 to 30,000 lb. of sand.

This completion method results in a minimum of investment since less casing is required, no expenditure for perforating is necessary, and the fracturing technique does not call for packers. It is most applicable in areas where there is a high frequency of natural fractures and crevices.

Oil string set part way through . . . Either 4½ or 5½-in. casing is ordinarily run and cemented at the top of either the so-called lower chalk or middle chalk zones. Cement plug is drilled and perforations made with clear water or crude oil in the hole according to the individual operator's preference. The open-hole section, which is from 40 to 80 ft. thick, is fractured with 10,000 to 30,000 lb. of sand through tubing below a packer. The perforated interval is usually fractured by pumping down the casing-tubing annulus, employing the packer to isolate the treatment from the open-hole zone. From 10,000 to 30,000 lb. of sand will be used to treat the perforated zone.

THE AUTHOR

Wayne L. McCann, consultant, Shreveport, La., is a graduate of Oklahoma University in petroleum engineering. Upon graduation he was employed by the Stanolind Oil & Gas Co. and served in various engineering capacities in the Mid-Continent. He was Stanolind's district engineer in their Shreveport office prior to his becoming a consultant in engineering and geology in 1953.

This completion method is a compromise between the other two basic types described, and is used by operators who desire a greater degree of selectivity of treatment than is obtainable by open-hole jobs. However, it results in some saving in perforating and casing expenditure as compared to the set-through type of completion.

Oil string set entirely through chalk . . . Ordinarily the 4½ and 5½-in. casing is set at a point 10 to 45 ft. below the base of the Annona chalk. Top of the cement plug will usually be positioned below the chalk section by using a float collar or following the top cementing plug with a wire line. In this way it is not necessary to drill the plug. After waiting on casing 24 to 48 hours, the top of the cement plug is checked and hole is loaded with fresh water or crude oil. After perforating the desired intervals, these zones are fractured selectively using hook-wall or anchor-type straddle packers. Usually from 10,000 to 30,000 lb. of sand is used for each stage of the selective treatments.

Fracturing Materials

The conventional fracture treatment is commenced by breaking down the formation with a few barrels of lease crude oil. Some operators prefer to pump in 500 gal. of hydrochloric acid at this point. Following breakdown of the formation, sand and heavy oil are mixed and displaced.

A round-grained sand is considered essential for large treatments in order to minimize tendency to plug while pumping the sand-oil mixture. Some operators, however, follow the round sand with a small amount (1,000 to 2,000 lb.) of angular 10-20 mesh sand. This angular sand is believed to assist in preventing backflow of the round sand when the well is placed on production.

Either crude oil from the Nacatoch sand produced in the field, or a heavy diesel-fuel-type refined oil is used to carry the sand. Both of these oils are relatively heavy and viscous, and have proved satisfactory except in extremely cold weather. A sand to oil ratio of from 1.5 to 3.0 lb. per gallon is used according to the individual operator's preference. Thickening agents have not been necessary with the Nacatoch crude or heavy refined oil. Sand-oil mixture is displaced by lease crude oil in sufficient amount to clean the tubing and casing of sand. Injection rate for the sand-heavy oil mixture will ordinarily range from 4 to 6 bbl. per minute. No conclusive data are available from which to conclude that appreciably higher pumping rates would result in improved well productivities.

"Soap" Washes Oil Out of Sand

Water-flooding engineers borrow idea from laundry; detergents prove effective in displacing petroleum from reservoir surfaces

by H. N. Dunning, Lun Hsiao, and R. T. Johansen

INCREASING the efficiency of water flooding by using surface-active additives has received wide attention, and the results of laboratory research have shown that use of detergents as water-flooding additives will reduce the residual petroleum in porous media. Some less extensive field tests have supported this conclusion but have not been entirely conclusive. Later studies have given conflicting evidence as to the relative worth of detergent additives for water flooding in water-wet (hydrophilic) or oil-wet (hydrophobic or lyophilic) reservoir materials.

The results of these studies emphasize the need for a more complete understanding of the fundamental principles involved in displacing petroleum from reservoir surfaces by injected fluids. Accordingly, a comprehensive research program was initiated to investigate the practical and fundamental aspects of detergency in petroleum production.

Principle of detergency . . . The problem of petroleum displacement from oil-wet surfaces is similar to that of cleaning soiled fabrics. A "dirty" cloth is one in which the fibers are generally wet with grease, and the problem of cleaning is to displace the grease by an aqueous phase. Water alone may not displace the grease (or petroleum), but a good detergent solution will do so by changing the contact angles at the water-oil-solid junction, from 0° in the oil to 180° in the water to 180° in the oil and 0° in the water.

From considerations of the energies involved in such a system:

$$\cos\theta_{wo}\,\gamma_{wo} = (W_{ws} - \gamma_w) - (W_{os} - \gamma_o) \qquad (1)$$

Rearranging:

$$\cos\theta_{wo} = \frac{(W_{ws} - \gamma_w) - (W_{os} - \gamma_o)}{\gamma_{wo}} \qquad (2)$$

Authors are with U. S. Bureau of Mines, Petroleum Experiment Station, Bartlesville, Okla. Material from R.I. 5020.

where W_{ws} (adhesional work between water and the solid) $= \gamma_w + \gamma_s - \gamma_{ws}$

W_{os} (adhesional work between oil and the solid) $= \gamma_o + \gamma_s - \gamma_{os}$

θ_{wo} = contact angle in the aqueous phase at the water-oil solid junction

and γ_w, γ_o, γ_s and γ_{wo} represent the interfacial tensions at the water-air, oil-air, solid-air, and water-oil interfaces, respectively. The terms "water" and "oil" represent the aqueous phase and the petroleum phase, respectively.

For complete displacement of oil by water, θ_{wo} must be zero when the water is advancing over the surface.

Substituting in Equation 2:

$$\cos\theta_{wo} = \frac{\gamma_{os} - \gamma_{ws}}{\gamma_{wo}} \qquad (3)$$

Neither γ_{os} nor γ_{ws} has been measured directly. However, if $\cos\theta_{wo}$ is to be positive, γ_{os} must be greater than γ_{ws}. Clean sand has hydrophilic (water-wet) surfaces. Thus, it would be expected that even water would spontaneously displace oil from a sand surface if the oil were pure (that is, a hydrocarbon).

However, complex molecules indigenous to petroleum are interfacially active and hence may lower γ_{os} by adsorption at the oil-sand interface, causing the sand to be preferentially oil wet.[1]

Detergents commonly are strongly adsorbed at sand surfaces from aqueous solutions. Therefore, these substances may decrease γ_{ws} to such an extent that it once more is lower than γ_{os}. Hence, $\cos\theta_{wo}$ becomes positive, and displacement of crude oil becomes possible.

Detergents also lower γ_{wo}, facilitating displacement of oil according to Equation 2. Adam[2] states, "Low surface tension of the aqueous solution and low interfacial tension are both desirable, but neither **alone** is a sufficient condition for good detergent power."

Displacement pressure . . . It must be recognized that the expression $\cos\theta_{wo}$ γ_{wo}, sometimes referred to as a displacement pressure, contains two variables. The term "γ_{wo}" is capable of relative changes, but the term "$\cos\theta_{wo}$" reflects changes in liquid-solid interfacial tensions that are capable of reversing the tendency for one phase to displace another from a solid surface.

A distinction should be made between displacement of oil from an oil-wet surface and ejection of discontinuous oil drops from porous media having water-wet surfaces. In the latter case, the interfacial tension at the oil-water interface, γ_{wo}, should be a deciding factor. Formation of smaller drops from a larger one or deformation of a drop from a spherical shape requires an increase in the area of the oil-water interface. This increase in area is opposed by γ_{wo}. Therefore, a low value of γ_{wo} should favor the movement of discontinuous oil drops through the irregular openings of the porous media.

Of the large number of water-flooding additives tested, water-soluble detergents have shown the most consistent effectiveness in increasing petroleum recovery. These substances generally are capable of causing considerable reductions in interfacial tensions at the water-oil, water-air, and water-sand interfaces.

Synthetic oil sands . . . Synthetic "oil sands" were prepared by mixing 2 kg. of Railroad White sand (40 to 70 mesh) with 135 g. of crude oil. This was about the maximum quantity of crude oil that could be used without excessive gravity drainage of the oil. The surface area of the sand was 110 sq. cm. per gram.

The crude oils were "topped" at 50° C. to remove the more volatile components. This treatment minimized erratic results caused by evaporation during the determinations and caused only minor changes in the specific gravity and viscosity of the crude oils.

Crude oils from Rio Bravo field in Kern County, California, and Oklahoma City field, Oklahoma County, Oklahoma, were used. Wells in Rio Bravo field produce from Rio Bravo zone of the lower Miocene age and the wells of the Oklahoma City Wilcox field pro-

DR. H. N. DUNNING

DR. LUN HSIAO

R. T. JOHANSEN

"Of the large number of water-flooding additives tested, water-soluble detergents have shown the most consistent effectiveness in increasing petroleum recovery. These substances generally are capable of causing considerable reductions in interfacial tensions at the water-oil, water-air, and water-sand interfaces."

duce from the Simpson zone of the Lower Ordovician age.

Some properties of these crude-oil samples are summarized in Table 1.

Classifying detergents . . . Detergent molecules contain both water-soluble (hydrophilic) and oil-soluble (lyophilic or hydrophobic) components. The balance or relative effects of these components in a molecule determine the solubility of the detergent and to a large extent its detergency properties. This balance has been referred to as hydrophobic-hydrophilic balance and as hydrophilic - lyophilic balance or "HLB."[3]

Detergents also are classified according to their ionization products. The nonionic detergents do not ionize and owe their solubility in water to polar groups in the hydrophilic chain. Cationic detergents ionize to form a cation (positive ion) that contains the oil-soluble portion of the molecule.

Detergents that ionize to form anions (negative ions) containing the oil-soluble portion of the molecule are classified as anionic. Soaps and many of the modern "built" detergents belong to this classification.

The detergents used in these studies represented the three ionization types, a range of HLB from oil-soluble to water-soluble forms, and a wide variety of chemical constituents. The detergents were used in the form in which they were received from the manufacturers.

Although some samples contained "builders" (inorganic substances such as the polyphosphates, borax, and carbonates), the majority contained 95 to 100 per cent of the active ingredients.

Centrifugal test . . . Thirty grams of the synthetic oil sand was placed in a 50-ml. centrifuge tube which then was filled with about 30 ml. of the detergent solution to be tested. Triplicate tests were performed on groups of eight samples in which one of the tubes contained distilled water as a standard.

The centrifugal method was used because the determinations may be made rapidly enough to allow testing of a large number of samples.

Surface-tension values at 25° C. were determined by the du Nouy ring method. For water-soluble detergents, 1 per cent solutions were used. For detergents not soluble to this extent, saturated solutions were used.

Displacement Efficiencies

The ability of a detergent solution to displace petroleum from solid surfaces is a primary requirement if the detergent is to aid in a more complete recovery of petroleum from reservoirs that have hydrophobic surfaces. However, this is not the only requirement, as better displacement of petroleum may not necessarily result in more complete petroleum recovery.

This is illustrated by the large amount of residual oil commonly remaining in formations that are considered to be water wet. After effective displacement of petroleum by an aqueous phase, the residual oil may be present in discontinuous drops lodged in the irregular openings of the porous medium. A decrease in the interfacial tension between the oil drops and the aqueous phase would favor formation of smaller or more labile drops that might be able to traverse the tortuous channels partly filled with water.

In the centrifugal-displacement test used in these studies, oil that had been displaced from the sand surface to form isolated drops was subjected to a centrifugal force that tended to eject it from the medium. The removal of displaced oil from the medium was expedited by agitating the sand between applications of centrifugal force. These conditions, of course, are not encountered in actual water-flooding conditions.

All good as water . . . The least effective of the detergents tested produced about the same effect as water. The relative displacement efficiencies of 0.1 per cent solutions of 64 detergents tested are recorded in Table 2.

Except for Igepal CO-710 and Pyronate, these displacement efficiencies were determined with a synthetic oil sand containing 67.5 g. of Rio Bravo crude oil per kilogram of sand. The displacement efficiencies of these two detergents were determined with a similar synthetic oil sand prepared with Oklahoma City Wilcox crude oil.

The BAASH ROSS "MULTIPLEX"

DOUBLE-ROW TAPERED BEARINGS
Maintain sheave alignment under both radial and thrust loads—give maximum resistance to sheave wobble, yet are close-coupled and rugged.
ROLLED STEEL PLATES
carry all sheave loads—streamlined cast steel outer shell is completely load-free. Weight is concentrated low for steady block travel.
INTERNAL POCKETS
may be filled with lead to increase falling speed of Blocks, as desired.
ALL-IN-ONE CONNECTOR
Both the swivel and elevators are supported simultaneously without interference. Automatic hook lock cannot open under load, guides hook into position when open.

"MULTIPLEX" BLOCKS *are more compact*

than any other Block Assembly of comparable capacity

10 Sizes . . . 100 to 300 tons . . . 3, 4 or 5 sheaves.

BAASH-ROSS TOOL COMPANY

Los Angeles...Houston...Oklahoma City...Odessa...Casper...Canton, O....New York City

The displacement efficiencies of the 38 nonionic detergents tested ranged from 1.02 to 1.38. The average value was 1.24, and the average standard deviation 0.095.

TABLE 1—PROPERTIES OF PETROLEUM SAMPLES

	Rio Bravo	Okla. City Wilcox
Specific gravity at 60°/60° F.	0.828	0.834
Gravity, °A.P.I.	39.4	38.3
Viscosity at 25° C., cp.	2.68	5.42
Viscosity at 25° C., Saybolt sec.	37.4	48.8
Interfacial tension at 25° C., dynes per cm.	19.8	19.9

The detergent properties of nonionic detergents often are enhanced by mixing them with inorganic builders. The polyphosphates are among the most effective builders for these detergents in many applications. Since the builders are usually less expensive than pure detergents, their use would have the added advantage of lowering the cost of nonionic detergents as water-flooding additives.

Surface activity . . . Reference to Table 2 shows that for the Ethomids there is a general correlation between surface activity (decrease in surface tension) and displacement efficiency. The members of this series that have the highest surface activity also have the highest displacement efficiency. This is only a general trend, and there are individual exceptions.

A similar but more marked trend was reported for three series of polyoxyethylated detergents.[4]

Other evidence of a correlation between surface activity and displacement efficiency within a series of detergents based on the same hydrophobic group and made by the same company is

TABLE 2—DISPLACEMENT EFFICIENCIES AND DETERGENT PROPERTIES

Amount of oil in oil-wet sand = 0.063 g./g.
Weight of oil sand = 30.0 g.
Weight of detergent solution = 30.0 g.

Line No.	Detergent designation and manufacturer	Composition and type	Per cent active ingredient	Surface* tension, dynes/cm.	Cloud point, °C.*	Displacement efficiency†	Standard deviation of disp. eff.
1.	Aerosol 1-B—American Cyanamid Co.	Diisobutyl sodium sulfo succinate—Anionic	100	26.3	‡S	0.96	0.031
2.	Aerosol 0-S—American Cyanamid Co.	Isopropyl naphthalene sodium sulfonate—Anionic	95	34.4	‡D	1.03	0.071
3.	Ahcol 150—Arnold, Hoffman & Co., Inc.	Sulfonated castor oil—Anionic	50	36.0	D	1.03	0.050
4.	Ahcol 350—Arnold, Hoffman & Co., Inc.	Sulfonated tall oil—Anionic	50	34.2	S	1.21	0.116
5.	Ahcol 385—Arnold, Hoffman & Co., Inc.	Sulfonated tall oil—Anionic	75	33.3	D	1.13	0.141
6.	Ahcowet ANS—Arnold, Hoffman & Co., Inc.	Sodium salt of sulfonated alkyl benzene—Anionic	40	31.2	S	1.03	0.045
7.	Algicide ATM-50—Oronite Chemical Co.	Alkylbenzyltrimethyl-ammonium chloride—Cationic	50	41.3	S	0.91	0.086
8.	Alkaterge OX—Commercial Solvents Corp.	Substituted oxazoline—Cationic	95	29.0	D	1.08	0.067
9.	Barisol BRM—Dexter Chemcial Corp.	Potassium salt of organic phosphate—Anionic		30.6	S	1.02	0.084
10.	Calsolene oil HSA—Arnold, Hoffman & Co., Inc.	Sodium salt of sulfated fatty acid ester—Anionic	45	32.6	S	1.04	0.001
11.	Emulphor ON-870—General Dyestuff Corp.	Polyethylene glycol oleyl ether—Nonionic	100	37.3	100	1.24	0.086
12.	Emulphor VN-430—General Dyestuff Corp.	Polyethylene glycol oleate—Nonionic	100	30.4	< 0	1.37	0.050
13.	Emulphor EL-719—General Dyestuff Corp.	Polyethylene glycol condensate of castor oil—Nonionic	97	38.3	74.0	1.26	0.059
14.	Ethofat 60/15—Armour & Co.	Ethylene oxide condensate of stearic acid—Nonionic	100	42.7	D	1.02	0.059
15.	Ethofat C-25—Armour & Co.	Ethylene oxide condensate of coco fatty acids—Nonionic		33.7	69.2	1.30	0.001
16.	Ethomeen 18/20—Armour & Co.	Ethylene oxide condensate of stearyl amine—Cationic	100	34.6	87.0	1.28	0.001
17.	Ethomeen S/20—Armour & Co.	Ethylene oxide condensate of soybean amine—Cationic	100	35.5	>100	1.33	0.116
18.	Ethomid HT/15—Armour & Co.	Ethylene oxide condensate of hydrogenated tallow—Nonionic	100	30.6	< 0	1.31	0.145
19.	Ethomid HT/20—Armour & Co.	Ethylene oxide condensate of hydrogenated tallow—Nonionic	100	32.9	73.2	1.25	0.050
20.	Ethomid HT/25—Armour & Co.	Ethylene oxide condensate of hydrogenated tallow—Nonionic	100	36.5	>100	1.26	0.001
21.	Ethomid HT/30—Armour & Co.	Ethylene oxide condensate of hydrogenated tallow—Nonionic	100	37.9	>100	1.20	0.200
22.	Ethomid HT/40—Armour & Co.	Ethylene oxide condensate of hydrogenated tallow—Nonionic	100	40.2	>100	1.21	0.174
23.	Ethomid HT/50—Armour & Co.	Ethylene oxide condensate of hydrogenated tallow—Nonionic	100	40.4	>100	1.23	0.189
24.	Ethomid HT/60—Armour & Co.	Ethylene oxide condensate of hydrogenated tallow—Nonionic	100	42.0	>100	1.20	0.168
25.	Ethomid C/25—Armour & Co.	Ethylene oxide condensate of coco amide—Nonionic	100	33.1	>100	1.15	0.114
26.	Ethomid C/60—Armour & Co.	Ethylene oxide condensate of coco amide—Nonionic	100	37.8	>100	1.18	0.087
27.	Ethomid RO/25—Armour & Co.	Ethylene oxide condensate of red oil amide—Nonionic	100	30.5	52.5 (Hazy)	1.26	0.087
28.	F-126—Minnesota Mining & Mfg. Co.	Chiefly perfluorocaprylic acid—Anionic		17.9	S	0.97	0.173
29.	Igepal CA-630—General Dyestuff Corp.	Alkyl aryl polyethylene glycol ether—Nonionic	100	30.3	52.2	1.28	0.094

obtained by comparing Igepal CA-630 with Igepal CO-710 and Emulphor VN-430 with Emulphor ON-870. There is no apparent correlation between surface activity and displacement efficiency when a variety of detergents of different chemical composition are compared. Correlations of this nature could be extended from one kind of detergent to another. The correlation between surface activity and displacement efficiency within a related series, however, is expected, since both of these properties are influenced by the HLB of the detergent.

The displacement efficiencies of 21 anionic detergents tested averaged 1.09, and were markedly inferior to the nonionics in this respect. However, the Nacconols, Tide, and Ahcol 350 were about as effective as the average nonionic detergent. These are heavy-duty detergent formulations containing carefully selected builders. It would appear that some anionic detergents, particularly the alkyl aryl sulfonates, can be prepared in formulations to give high displacement efficiency. The reaction of this type of detergent with the rather concentrated brines that sometimes are encountered in water-flooding operations may limit their use. Therefore, if anionic-detergent formulations are to be used, a knowledge of the floodwater composition is required.

Not decisive factor . . . The results of tests with solutions of wetting agent F-126 and Sequestrene NA4 show that surface activity is not necessarily a decisive factor when two detergents of different types are being compared.

Wetting agent F-126 is an unusual substance, since it lowers the surface tension of water to 18 dynes per centi-

TABLE 2—DISPLACEMENT EFFICIENCIES AND DETERGENT PROPERTIES (Continued)

Line No.	Detergent designation and manufacturer	Composition and type	Per cent active ingredient	Surface* tension, dynes/cm.	Cloud point, °C.*	Displacement efficiency†	Standard deviation of disp. eff.
30.	Igepal CO-710—General Dyestuff Corp.	Alkyl aryl polyethylene glycol ether—Nonionic	100	32.1	72.2	1.28	0.161
31.	Igepal CO-730—General Dyestuff Corp.	Alkyl aryl polyethylene glycol ether—Nonionic	100	35.8	95.8	1.29	0.075
32.	Igepal CO-850—General Dyestuff Corp.	Alkyl aryl polyethylene glycol ether—Nonionic	100	37.4	>100	1.20	0.070
33.	Iissapol N-380—Arnold, Hoffman & Co., Inc.	Ethylene oxide condensate of alkyl phenol—Nonionic	90	30.8	37.5	1.33	0.038
34.	Lubrol W—Arnold, Hoffman & Co., Inc.	Ethylene oxide condensate of fatty alcohol—Nonionic	100	38.3	>100	1.24	0.022
35.	Marasperse CB—Marathon Corp.	Partly desulfonated sodium lignosulfonate—Anionic	100	47.4	S	1.01	0.084
36.	Marasperse N—Marathon Corp.	Sodium lignosulfonate—Anionic	100	52.5	S	0.98	0.148
37.	Nacconol LAL—National Aniline Division, Allied Chem. & Dye Corp.	Sodium Lauryl sulfoacetate—Anionic		29.0	S	1.23	0.039
38.	Nacconol NRSF—National Aniline Division, Allied Chem. & Dye Corp.	Alkyl aryl sulfonate—Anionic	90	32.0	S	1.28	0.067
39.	Nekal BX-76—General Dyestuff Corp.	Sodium alkyl naphthalene sulfonate—Anionic	70	31.3	S	1.10	0.031
40.	Nonic 218—Sharples Chemicals, Inc.	Polyethylene gylcol tertdodecylthioether—Nonionic	95	29.5	56.2	1.29	0.192
41.	Nonisol 210—Alrose Chemical Co.	Polyethylene glycol ester of oleic acid—Nonionic	100	36.4	<0	1.20	0.084
42.	Oronite Dispersant NI-W—Oronite Chemical Co.	Alkylphenylpolyoxyethylene ether—Nonionic	100	30.6	44.7	1.29	0.161
43.	Oronite 52559-R—Oronite Chemical Co.	Alkyl aryl polyethylene glycol ether—Nonionic	100	42.5	>100	1.18	0.115
44.	Oronite 52560-R—Oronite Chemical Co.	Alkyl aryl polyethylene glycol ether—Nonionic	100	43.8	>100	1.21	0.110
45.	Pluronics F-68—Wyandotte Chem. Corp.	Condensate of ethylene oxide with propylene glycol and oxide—Nonionic	100	42.5	>100	1.21	0.045
46.	Pyonate—L. Sonneborn Sons., Inc.	Petroleum sulfonate, sodium salt—Anionic		34.0	S	1.04	0.118
47.	Santamerse KDT—Monsanto Chem. Co.	Substituted polyamine—Nonionic	100	27.8	5.5	1.38	0.170
48.	Sequestrene NA4—Alrose Chemical	Tetrasodium ethylenediaminetetraacetate dihydrate—Anionic	100	71.6	S	1.30	0.081
49.	Sterox SK—Monsanto Chemical Co.	Polyoxyethylene thioether—Nonionic	100	29.2	1.7	1.21	0.045
50.	Synthetics B-79—Hercules Powder Co.	Polyoxyethylene glycol ether of alkylated phenol—Nonionic	100	31.1	79.5	1.28	0.069
51.	Synthetics B-48—Hercules Powder Co.	Polyethylene glycol ester of rosin—Nonionic	100	36.0	52.0	1.30	0.001
52.	Tergitol-4—Carbide & Carbon Chem. Co.	Sodium sulfate derivative of branched fatty alcohol—Anionic	25	29.6	D	1.04	0.092
53.	Tide—Proctor & Gamble Co.	Heavy-duty detergent formulation—Anionic		15.0	S	1.26	0.038
54.	Triton K-60—Rohm & Haas Co.	Stearyl dimethyl benzyl ammonium chloride—Cationic	25	34.3	D	1.08	0.114
55.	Triton X-45—Rohm & Haas Co.	Alkyl aryl polyethylene glycol ether—Nonionic	100	28.9	>0	1.31	0.111
56.	Triton X-114—Rohm & Haas Co.	Alkyl aryl polyethylene glycol ether—Nonionic	100	29.6	19.4	1.29	0.070
57.	Triton X-100—Rohm & Haas Co.	Alkyl aryl polyethylene glycol ether—Nonionic	100	31.4	68.3	1.28	0.074
58.	Triton X-102—Rohm & Haas Co.	Alkyl aryl polyethylene glycol ether—Nonionic	100	33.5	90.1	1.22	0.067
59.	Triton X-155—Rohm & Haas Co.	Alkyl aryl polyethylene glycol ether—Nonionic	100	29.8	>0	1.24	0.045
60.	Triton X-200—Rohm & Haas Co.	Sodium salt of alkyl aryl polyether sulfonate—Anionic	28	29.3	S	1.02	0.081
61.	Tween-80—Atlas Powder Co.	Polyoxyethylene sorbitan monooleate—Nonionic	100	37.9	89	1.21	0.190
		OR					
62.	Victawet 12—Victor Chemical Works	Alkyl—O—P=O—Nonionic	100	27.0	D	1.11	0.045
		OR					
63.	Victawet 35B—Victor Chemical Works	$Na[R(P{=}O)_2]$; R = 2-ethylhexyl—Anionic	70	26.5	S	1.08	0.054
64.	Victawet 58B—Victor Chemical Works	$Na[R(P{=}O)_2]$; R = caprylic—Anionic	70	24.7	S	1.01	0.087

*Concentration of solutions—1.0 weight per cent. †Concentration of solutions—0.1 weight per cent. (1,000 p.p.m.). †S—forms clear solution at 25° C. §D—forms turbid dispersion at 25° C.

meter. Therefore, it is more surface-active than almost any known pure substance; yet, it was quit ineffective in displacing petroleum from sand.

Sequestrene NA4 has virtually no surface activity, but it was the most effective anionic substance tested.

The Marasperses, which are marketed as dispersants rather than detergents, are low both in displacement efficiency and surface activity.

The small number of cationic detergents tested were ineffective as petroleum-displacing agents with the exception of the Ethomeens. The average displacement efficiency was 1.13, and the average standard deviation was 0.077. The Ethomeens can be made with varying degrees of ionization tendency from exceedingly strong to almost nonionic forms.

A few of the nonionic detergents also were tested with crude oil from Oklahoma City oil field. The average amount of oil displaced was 68 per cent of the total oil. From 30 g. of the synthetic oil sand prepared with Rio Bravo crude oil, water displaced 63 per cent of all the oil. The average displacement efficiency of the nonionic detergents tested with the Oklahoma City Wilcox synthetic sand was 1.26 and for the Rio Bravo synthetic oil sand was 1.24. An average of 86 per cent and 78 per cent of the total oil present was displaced by nonionic detergent solutions from the Oklahoma City Wilcox and Rio Bravo synthetic oil sands, respectively.

Cloud point described . . . Nonionic detergents containing a polyoxyethylene chain as the hydrophilic group often are less soluble in warm water than in cold water. The temperatures at which such detergents cease to form true solutions are known as cloud points. The cloud point is a useful physical property, since it may be used as a measure of the HLB of the detergent as well as a solubility reference point.[5]

Cloud points of 45° to 55° C. are generally indicative of the HLB necessary to establish optimum wetting properties for this type of detergent in many applications. The results of an earlier study[4] showed that many polyoxyethylated detergents with cloud points above 55° C. maintained a high petroleum-displacement efficiency.

The detergents having cloud points from about 40° to 70° C. have a maximum in displacement efficiency.

The detergents having cloud points in this range are considerably more efficient in oil displacement than the average of the nonionic detergents tested. These results indicate that the HLB of a detergent is one of the decisive factors in determining its petroleum-displacement efficiency.

The study of polyoxyethylated detergents reported recently[4] showed that detergents having cloud points somewhat below the test temperature were highest in displacement efficiency. It would be expected that detergents of higher cloud points (more water soluble) would be more effective at higher temperatures.

If this postulate is correct, considering a series based on the same hydrophobic group, the best detergent for oil displacement should be the one having a cloud point near the temperature of the test.

Adsorption at the Sand-Water Interface

These studies were intended not only to determine displacement efficiency but also to investigate accumulation (adsorption from aqueous solutions) of detergents on sand surfaces. This accumulation of a detergent on the sand surfaces removes the detergent from solution and may economically prohibit its use.

Adsorption spectra of the detergent solutions to be studied were determined with a Beckman DU spectrophotometer, and subsequent concentration-absorbance (optical density) values were

S & R
Pump Suction
STRAINER

The S&R straining unit is fabricated of heavy woven steel cloth, fitted with solid steel bottom and a flanged top with lifting bar and rigidly framed opening on suction side.

The main steel barrel of the unit is 13⅜" OD, 36" long. It can be furnished with inlets and outlets for 6", 8", or 10" suctions. The straining unit is held in this barrel by a steel plate cap which is fastened to a yoke; flanged ring on top is fitted with an O ring. T handle on top is easily adjusted by hand and assures a pressure tight seal.

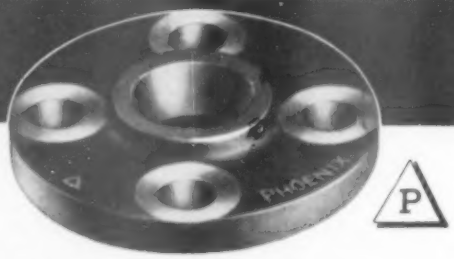
Here's a strainer that saves time and money. It's durable, easy to clean, efficient in operation.

Write for details.

S & R TOOL & SUPPLY CO.
P. O. Box 1755 Houston, Texas

Export: 42 Broadway, N. Y. 4, N. Y.

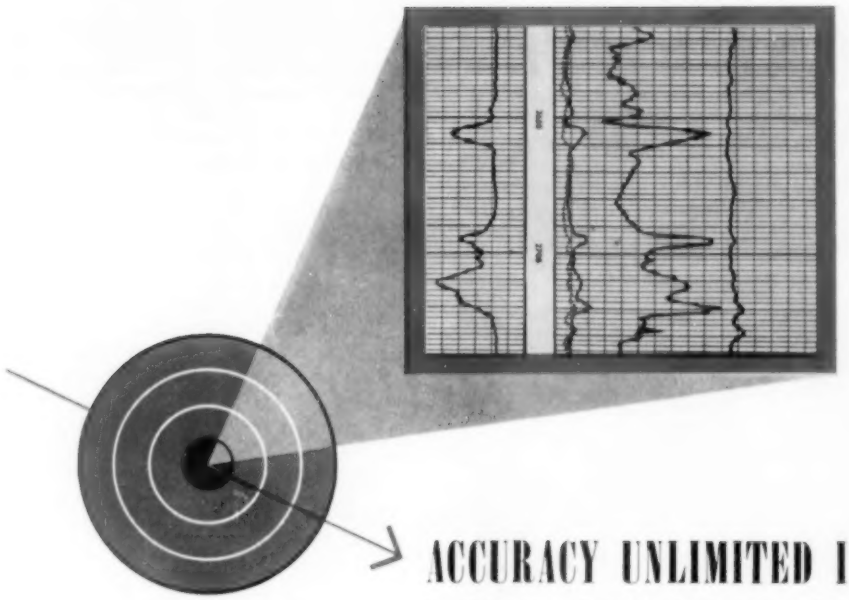
PHOENIX Drop-Forged FLANGES MEAN . . .
MAXIMUM STRENGTH



Long life is assured with Phoenix maximum strength flanges. Forged of mild steel, they are available in a wide range of styles and sizes. Meet ASA requirements and ASME and ASTM specifications.

NEW CATALOG!
Send for free brochure showing Phoenix Complete Line.

FLANGE DIVISION
PHOENIX MANUFACTURING CO.
Catasauqua, Pa. • Joliet, Ill.



ACCURACY UNLIMITED IN FM SYSTEM

LOGGING DATA MORE PRECISELY DETAILED

The technical standard for modern electrical logging is simple. Measuring and recording instrumentation must be of such precision that pinpoint accuracy is a reality.

But conventional logs can not measure up to the modern standard. And this failure prompted Halliburton researchers to develop the completely new system of *more accurate, more complete logging*—the Halliburton Frequency Modulation system.

New FM accuracy makes it possible to obtain petrophysical data. Data on comparative porosities of different parts of the formation provide a factual basis for estimating the amount of oil available. When used with pressure studies, FM data can help predict IP.

Halliburton's exclusive system provides the only means of transmitting down hole potential levels to the surface without loss of pinpoint accuracy due to interference of cable leakage or other extraneous source. FM Logging is the only system based on electronic controls, vacuum tube metering circuits and carrier frequency transmission signals.

Interpretation is based on precise recordings of curves from two or three electrode configurations, zero basings and identical reference points. Even the cable is replaced as a part of the measuring circuit by electronic tube circuits.

Another time saving, cost reducing feature of FM Logging is the elimination of the three or four trips usually required. *In one fast trip,* the FM system records all the data required at a cost of only a few cents a foot!

Call for the system of electrical logging that is the modern technical standard—Halliburton's exclusive FM Logging. Call your local or district Halliburton office. Or contact Halliburton Oil Well Cementing Company, Duncan, Oklahoma.

HALLIBURTON

ELECTRICAL WELL SERVICES

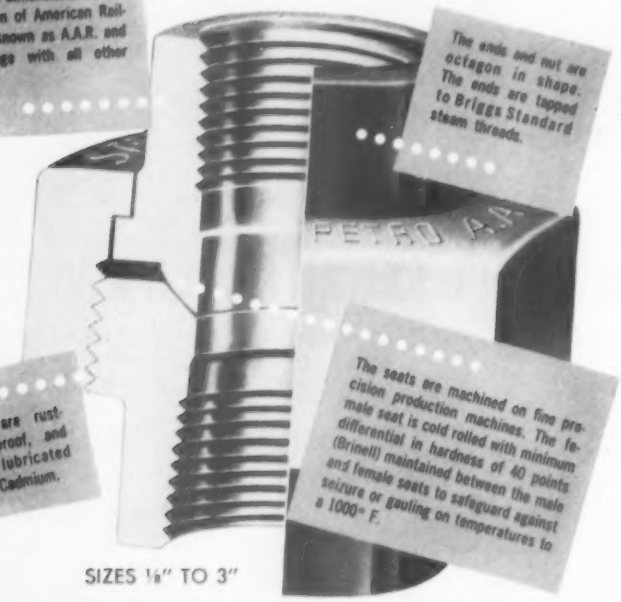
PERPETUAL PROGRESS IN PRODUCTION IMPROVEMENT TECHNIQUES

PERMANENTLY LUBRICATED...

WITH UDYLITE CADMIUM TO GIVE LONGER SERVICE AND TO AFFORD QUICK AND ECONOMICAL MAKE AND BREAK

Petro Unions conform to a recognized American dimensional standard (Association of American Railroads) better known as A.A.R. and will interchange with all other A.A.R. unions.

The ends and nut are octagon in shape. The ends are tapped to Briggs Standard steam threads.



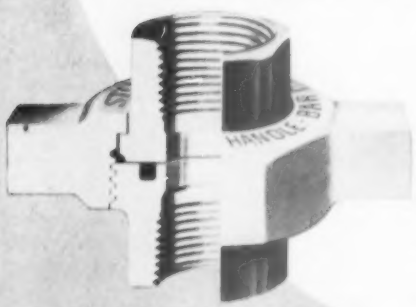
Nut threads are rust-proof, spark-proof, and permanently lubricated with Udylite Cadmium.

The seats are machined on fine precision production machines. The female seat is cold rolled with minimum differential in hardness of 40 points (Brinell) maintained between the male and female seats to safeguard against seizure or gauling on temperatures to a 1000° F.

SIZES ⅛" TO 3"

PETRO A.A.R.

This union is hot-forged of A.I.S.I. 1023 open hearth, silicon killed forging steel. It meets all chemical specifications for forged steel pipe fittings. It is rated for temperatures from 100° below zero F. to 1000° above zero F. and on pressures 900 S.W.P. and 3000 lbs. C.W.P.



"O" RING HANDLE-BAR

QUICK TYPE UNION

These unions do not depend on compression or force, as the terms relate to common gasket type unions. A positive pressure is affected with a synthetic oil-resistant "O" Ring set in a groove between two mating surfaces. "O" Ring, although replaceable, will not drop out when union is disconnected.

For additional information about these and other Forged Steel Unions write to Department C, or refer to listings in Composite and Refinery Catalogs.

ORDER BY TRADE NAME FROM YOUR LOCAL SUPPLY STORE

ORIGINATORS AND PIONEERS OF STEEL UNIONS SINCE 1912

CLAYTON MARK & COMPANY

1900 DEMPSTER STREET • EVANSTON, ILLINOIS

determined at the wave length of one of the maxima in the adsorption spectrum. The maximum at 276 mμ was used for detergents containing a phenyl group.

Aqueous detergent solutions of known concentration were prepared and calibration curves of absorbance versus concentration were determined. Calibration curves were linear in accordance with Lambert-Beer's law. Detergent solutions of known volume and various known concentrations were shaken with sand.

The equilibrium concentrations were then determined from the calibration curves and the amount of detergent adsorbed (removed from solution) was calculated from the observed change in concentration.

Surface area important . . . The surface area of the adsorbent is one of the most important variables in adsorption from solutions. For this reason, adsorption isotherms based on surface area rather than weight of adsorbent are readily correlated with the data of other laboratories. Furthermore, the approximate amount of adsorption to be expected in a reservoir can be calculated from laboratory data if values of surface area are available.

According to chromatographic theories[6] a detergent zone may be caused to move through a formation by following the injected detergent solution with water. The shape of the adsorption isotherm determines whether the boundaries of the detergent zone will tend to decrease in concentration spontaneously or to resist decreases in concentration.

The detergents studied have adsorption isotherms that are concave toward the abscissa at the lower concentrations. Therefore, the leading boundary of the detergent zone should exhibit self-sharpening tendencies[7] thus resisting decreases in concentration, whereas the trailing boundary should tend to spread out spontaneously. This theory is strictly applicable only if equilibrium is established instantaneously. A finite rate of equilibrium establishment would result in a gradual broadening of the detergent zone with a consequent lowering in concentration.

The adsorption isotherms of Oronite NI-W are unusually good examples of the Langmuir isotherm. If the Langmuir equation can be applied to an adsorption process, a plot of C/Γ versus C should be linear, where "C" is the equivalent concentration (p.p.m.) and "Γ" is the grams of detergent adsorbed per square centimeter of solid surface. This was observed to be the case in a Langmuir plot of the adsorption of NI-W on sand samples of two mesh ranges.

Igepal CA-630 presents an interesting contradiction since its adsorption is not described by any of the usual isotherms. However, since the low-concentration portion of both isotherms are nearly linear, an approximation of the rate at which zones of these detergents would be expected to move through porous media can be obtained by the methods described by Preston and Calhoun[6] and Trueblood.[7]

Calculations for typical nonionic detergents based on either the linear portion of the isotherms or on the Langmuir equation, where applicable, indicate that the detergent zone may move from 0.05 to 0.2 times as fast as the advancing water front when the injected detergent solutions are dilute (25 to 500 p.p.m.).

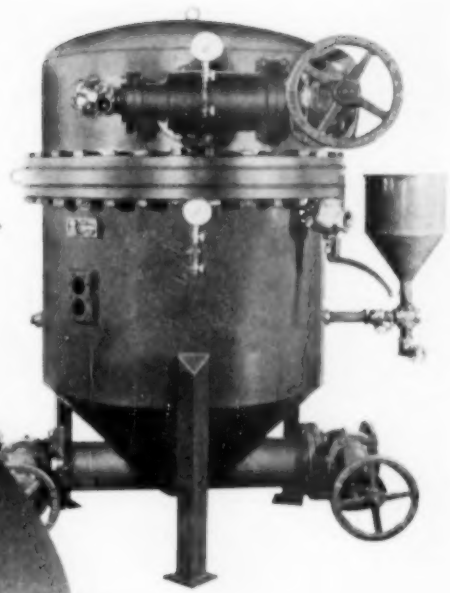
Porosity and adsorption . . . According to the equations for rate of zone movement, the rate at which a detergent zone will move through a porous medium depends on the porosity of the medium and on the constants of the adsorption isotherm. These constants, in turn, depend on the surface area of the medium. Therefore, the above calculated rates apply only to the particular medium used (Tip Top sand, 140 to 200 mesh, 305 sq. cm. per gram) at the stated porosity. Use of the proper functions of these variables allows data obtained with one medium to be applied to the calculation of the rate of detergent-zone movement through media of different surface areas and porosities but similar surface composition.

As mentioned above, these calculations assume that equilibrium conditions are established instantaneously. Results of preliminary studies indicate that equilibrium may not necessarily be established under normal flooding conditions.

If this is true, the concentration of the zone will be less than that of the injected solution (if the detergent zone is being moved by pure solvent), but the detergent front will move more rapidly than calculated from the adsorption isotherms. Thus, the detrimental effect of decreasing concentration is countered by a beneficial effect of faster movement of the detergent zone.

References

1. Dunning, H. N., Moore, J. W., and Denekas, M. O., Interfacial Activities and Porphyrin Contents of Petroleum Extracts, Ind. Eng. Chem., Vol. 45, August 1953, pp. 1759-1765.
2. Adam, N. K., The Physics and Chemistry of Surfaces, Oxford University Press, London, 1941, 430 pp.
3. Griffin, W. C., Classification of Surface-Active Agents by "HLB," Jour. Soc. Cosmetic Chem., Vol. 1, No. 5, December 1949, pp. 311-326.
4. Dunning, H. N., Gustafson, H. J., and



this small filter...

MAKES TOUGH JOBS EASY!

Stellar® *filter*

SMALL in size and operating cost, this Stellar Filter is BIG in results and efficiency. It saves up to 75% in space and up to 90% in weight. No coagulants are used. Operation may be by unskilled personnel.

The heart of the Stellar is the Air-Bump feature which keeps the Filter clean. No wasteful back washing is required for many applications.

Oil men are using the Stellar Filter for—

★ Filtration of water or brine for flooding, repressuring or disposal purposes.

★ Filtration of cooling water and recirculating process water.

★ Removal of ferrous sulphide and other impurities from monoethanolamine in natural gas purification.

INFILCO INC. *Tucson, Arizona*

INFILCO

Plants in Chicago and Joliet, Illinois

FIELD OFFICES IN 35 PRINCIPAL CITIES IN THE U.S., CANADA AND MEXICO

For more information on how the Stellar Filter can work for you, use coupon to the right.

INFILCO INC., P.O. Box 5033, Tucson, Arizona

Please send your illustrated Stellar Filter Bulletin No. 1560-O.

NAME_____

TITLE_____

COMPANY_____

ADDRESS_____

CITY_____ STATE_____

Guiberson Casing Swab with "GW" Cups

FLEXIBILITY

that means every-drop casing swabbing!

GUIBERSON "GW" CUPS

**hug casing wall—
automatic seal,
controlled pipe contact**

- Unequalled in rough or mixed casing strings
- Stout, flexible lip brings up every drop
- Won't down-swab or hang on casing collars
- Perfect for unloading shallow wells
- Abrasion resistant compound — takes up own wear
- Performs better — lasts longer — costs no more
- Interchangeable on the Guiberson Casing Swab

Guiberson Swab with "GW" and "K" cups offers greatest size range on the market.

Better Be Safe Than Sorry!

THE
GUIBERSON
CORPORATION
ESTABLISHED 1919 • DALLAS, TEXAS, U. S. A.
Sold By Leading Oil Field Supply Stores Everywhere

Johansen, R. T., Displacement of Petroleum From Sand by Solutions of Polyoxyethylated Detergents, Pres. 124th meeting, A.C.S., Chicago, September 7, 1953.

5. Cross, J. M., New Developments in Surface-Active Nonionics, Chem. Specialties Manufacturers Association, Chicago, 1950.

6. Preston, F. W., and Calhoun, J. C., Applications of Chromatography to Petroleum Production Research, Pennsylvania State College Min. Ind. Exp. Sta. Bull. 59, October 1951, pp. 36-52.

7. Trueblood, K. N., and Malmberg, E. W., An Experimental Study of Chromatography on Silicic Acid-Celite. The Applicability of the Theory of Chromatography, Jour. A.C.S., Vol. 72, September 1950, pp. 4112-4124.

Recommended Additional Reading

Calhoun, J. C., Stahl, C. D., Preston, F. W., and Nielsen, R. F., A Review of Laboratory Experiments on Wetting Agents for Water Flooding, Prod. Month., Vol. 16, No. 1, November 1951, pp. 15-23.

Breston, J. N., and Johnson, W. E., Experiments with Wetting Agents in the Bradford Field, Prod. Month., Vol. 16, No. 1, November 1951, pp. 24-30.

Moore, T. F., and Blum, H. A., Wettability in Surface-Active Agent Water Flooding, The Oil and Gas Journal, Vol. 51, No. 31, December 8, 1952, pp. 108-111.

Caro, R. A., Calhoun, J. C., and Nielsen, R. F., Experiments Using Surface-Active Agents to Increase Oil Recovery, Pennsylvania State College Min. Ind. Exp. Sta. Bull. 60, October 1952, pp. 57-59.

Denekas, M. O., Carlson, F. T., Moore, J. W., and Dodd, C. G., Materials Adsorbed at Crude Petroleum-Water Interfaces, Ind. Eng. Chem., Vol. 43, May 1951, pp. 1165-1169.

Dodd, C. G., Moore, J. W., and Denekas, M. O., Metalliferous Substances Adsorbed at Crude Petroleum-Water Interfaces, Ind. Eng. Chem., Vol. 44, November 1952, pp. 2585-2590.

Andreas, J. M., Hauser, E. A., and Tucker, W. B., Boundary Tension by Pendant Drops, Jour. Phys. Chem., Vol. 42, 1938, pp. 1001-1019.

Dunning, H. N., The Interfacial Activity of Mesoporphyrin IX and Some Derivatives, Jour. Colloid Sci., Vol. 8, No. 3, June 1953, pp. 279-287.

Slobod, R. L., Chambers, Adele, and Prehn, W. L., Use of Centrifuge for Determining Connate Water, Residual Oil, and Capillary Pressure Curves of Small Core Samples, Jour. Petrol. Technol., Vol. 3, No. 4, April 1951, pp. 127-134.

Harkins, W. D., and Jordan, H. F., A Method for the Determination of Surface and Interfacial Tension From the Maximum Pull on a Ring, Jour. A.C.S., Vol. 52, May 8, 1930, pp. 1751-1772.

Freud, R. B., and Freud, H. Z., A Theory of the Ring Method for the Determination of Surface Tension, Jour. A.C.S., Vol. 52, May 8, 1930, pp. 1772-1782.

Dunning, H. N., and Johansen, R. T., A Combination Thermostat and Elevating Platform for the Surface-Tension Balance, Rev. Sci. Instr., Vol. 24, December 1953.

Fineman, M. N., Brown, G. L., and Myers, R. J., Foaming of Nonionic Surface Active Agents, Jour. Phys. Chem., Vol. 56, No. 8, November 1952, pp. 963-966.

Muskat, M., Oil Recovery—100 per cent? Ind Eng. Chem., Vol. 45, No. 7, July 1953, pp. 1401-1405.

Youden, W. J., Statistical Methods for Chemists, John Wiley & Sons, Inc., New York, 1951, 123 pp.

Weiser, H. B., Colloid Chemistry, John Wiley & Sons, Inc., New York, 1939, 428 pp.

ON-THE-SPOT Testing

WITH BREAXIT
REGISTERED U. S. PAT. OFF.

Emulsion Breaking Compounds

The *Breaxits* are a group of emulsion-breaking compounds — specially adapted for each job *on-the-spot.* A trained, Technical Service engineer tests live oil on your lease and determines the type and amount of BREAXIT you need to give pipe line oil. The nearest Humble Bulk Plant makes delivery directly to your lease in Texas.

*For complete details on BREAXIT, write:

Sales Technical Service Division
Humble Oil & Refining Co.
P. O. Box 2180
Houston, Texas

HUMBLE

BREAXIT *is sold by*

HUMBLE OIL & REFINING CO.

by W. L. Nelson
Technical Editor

QUESTIONS ON TECHNOLOGY

Cost of Refining High-Sulfur Crudes

"We are offered a crude oil that contains over 1.0 per cent sulfur. What is the cost of the extra corrosion that we will encounter?"—Wm. G.P.

The cost of corrosion obviously varies widely. One of the first attempts to determine the cost of corrosion was that of Dr. F. N. Speller and his colleagues. For the year 1927, he arrived at a cost of 4.5 cents per barrel which for present-day inflated costs, would amount to at least 12 cents per barrel. During 1953, a cost of 9.0 cents per barrel was suggested (Pet. Processing, November 1953, page 1685) and early in 1954, a committee of the A.P.I. suggested 11.25 cents per barrel. The items of cost considered in each of the above estimates were different and accordingly, Table 1 herein attempts to explain the differences and to estimate what the actual total cost may be.

The A.P.I. committee was aware when making its estimate that additional costs besides those evaluated were possible by fires, accidents, unscheduled shutdowns, leaks, disposal of wastes, extra insurance, etc. In fact, none of those that estimated corrosion costs included all of these items. It seems that these and related items may contribute to the extent of about 3.6 cents per barrel as indicated in Table 1. This brings the total cost to about 16.6 cents per barrel and a similar figure (18 cents) was suggested by an oil-company representative.

A split between the cost of corrosion due to sulfur alone and the costs of the other types of corrosion such as sourness, naphthenic acids, salt, water circulation, high-temperature oxidation, and even plain atmospheric rusting, is difficult. However, it is estimated that high-sulfur alone contributed 6-7 cents of the total cost of corrosion (16.8-18.0 cents), so that if half the crude oil now being processed in the United States is high-sulfur oil (0.6 per cent S or higher), the cost of corrosion by high-sulfur alone is at least 12 cents per barrel. This is an average figure representing a low of about 6 cents per barrel which might apply to crude oils that contain 0.5-1.2 per cent sulfur, to even 21 cents per barrel for crude oils that contain 4.6-6.0 per cent sulfur and are processed thoroughly by cracking.

The cost of corrosion by high sulfur alone might range somewhat as follows:

Per cent sulfur	Corrosion cost,* cents per bbl.
0.45-0.6	3 (1- 6)
0.6 -2.0	8 (5-12)
2.0 -4.0	11 (8-15)
4.0 -6.0	15 (12-21)

*Due to high sulfur alone.

If the crude oil is also sour, an additional penalty must be applied *(see Questions on Technology, January 26, 1953, page 403)* and in addition the corrosion due to sulfur should be increased somewhat (perhaps 20 per cent) because the sulfur compounds in "sour" oils (aside from hydrogen sulfide and mercaptans) are less stable and lead to more corrosion.

TABLE 1—ESTIMATES OF THE COST OF CORROSION TO REFINING

	Speller 1927 (4.5 cents per barrel)	Pet. Processing 1953 (9.0 cents per barrel)	A.P.I. 1954 (11.25 cents per barrel)	Estimate of all items
1. Maintenance (about 70 per cent of total)	Yes	Yes	7.1	7.1
2. Lost production (5 days per year)	Yes		1.8	1.8
3. Depreciation (more rapid)	Yes	Yes		1.5
Total	12.0 (1953)			
4. Material and labor for corrosion repair		Yes		0.3
Total		9.0 (1953)		
5. Built-in resistance (13 per cent of plant cost)			2.1	2.1
6. Inspection costs of tools and workmen and inventory			0.25	0.2
Total			11.25 (1954)	
7. Neutralization chemicals	(Not included by anyone)			*0.5
8. Cathodic protection of lines	(Not included by anyone)			Nil
9. Unscheduled shutdown time	(Not included by anyone)			1.5
10. Loss of product by leaks or contamination	(Not included by anyone)			0.7
11. Extra inspection cost (perhaps same as "6"	(Not included by anyone)			
12. Fires, accidents and insurance	(Not included by anyone)			0.3
13. Overdesign of equipment	(Not included by anyone)			0.5
14. Waste disposal and cost obligations	(Not included by anyone)			0.1
Total (estimate)		(†)		†16.6

*Includes half of desalting chemical or expense. †Staff article November 1953 mentions 18 cents.

How Much Are Pipeline Gathering Charges?

"What are customary pipeline gathering charges? Is a charge of 5 cents per barrel a reasonable charge?" M.W.P.

A charge of 5 cents per barrel is a low or very reasonable charge. A more common charge is 7½ cents and the lowest charge is about 3½ cents per barrel.

Pipeline charges have generally been reduced in recent years as in the following tabulation of rates of Humble Oil & Refining Co. for Winkler County, Texas:

	Cents per bbl.
1929 April 15	12½
1931 June 6	10
1934 June 26	7½
1938 October 26	5
1951	5

During 1948, gathering charges ranged from 3½ to 10 cents per barrel:

	Cents per bbl.
North Central Texas	5 to mainly 10
Oklahoma and Kansas	5-10
Illinois and Indiana	5-10
Gulf Coast	5
E. and W. Texas, and New Mexico	4 to mainly 5
N. La., S. Ark., and N. E. Texas	10 to mainly 4
Wyoming and Colorado	3½-5

How to Compute Boiler Heat Savings

by V. J. Calise

FOR any given boiler plant, you can determine in seconds the annual savings in millions of B.t.u. per year resulting from the recovery of heat from boiler blowoff by means of a continuous blowoff system. Merely use this simple, four-step procedure as applied to the accompanying table and curves:

1. Determine the total dissolved solids in the makeup in parts per million and choose the allowable concentration in the boiler in parts per million from the following chart based on A.B.A.I. standards:

Maximum permissible total dissolved solvents in boiler water for various pressures:

Boiler pressure, psig.	Total dissolved solids, p.p.m.
0- 300	3,500
301- 450	3,000
451- 600	2,500
601- 750	2,000
751- 900	1,500
901-1,000	1,250
1,001-1,500	1,000

Suggested limits sometimes recommended by experts for maximum permissible silica concentration in boiler water for various pressures are:

Boiler and turbine oper. press., psig	Max. silica in salines p.p.m. as SiO_2
250- 600	40-50
601- 900	20-30
901-1,200	10-20
More than 1,200	Less than 5-10 and less than 1 above 1,800 psig.

For high-pressure boilers, particularly where turbines are used with condensers for very low-pressure steam discharge, the maximum permissible silica concentration in the boiler water is usually set by the power engineer or consultant so that there will be no danger of turbine blade silica deposits.

Author is director of research and development, Graver Water Conditioning Co.

These values are subject to change based on operating experiences in the field and new experimental data.

2. From Table 1, find the per cent blowoff of the total evaporation. This table is based on 100 per cent makeup. If the makeup is less than 100 per cent, use this formula to calculate the blowoff in pounds per hour:

$$\text{Blowoff} = \frac{\text{(Makeup solids)}}{\text{(Max. allow. boiler T.D.S.)} - \text{(Makeup solids)}} \times \text{(Makeup for evaporation)}$$

Example:

Boiler pressure = 475 psi.

Total evaporation = 100,000 lb. per hour.

Makeup solids = 250 p.p.m.

Blowoff solids = Maximum allowable boiler T.D.S. 2,500 p.p.m. according to A.B.A.I.

Condensate returns = 50 per cent of total evaporation, or 50,000 lb. per hour.

Makeup for evaporation = 50,000 lb. per hour.

Blowoff = 250/(2,500 − 250) × 50,000 lb. per hour.

Total makeup = makeup for evaporation + blowoff = 55,550 lb. per hour.

Feed water = condensate returns + total makeup = 105,550 lb. per hour.

For determining the blowoff based on maintaining a given silica concentration in the boiler salines with a given silica concentration in the treated makeup, use this formula:

$$\text{Blowoff} = \frac{\text{(Makeup silica)}}{\text{(Max. allowable silica)} - \text{(Makeup silica)}} \times \text{(Makeup for evaporation)}$$

3. Using Curve 1 and knowing the total evaporation, determine the actual pounds per hour of blowoff.

4. Using Curve 2 and knowing the boiler pressure, determine the approximate annual savings in millions of B.t.u. per year. The actual dollar savings per year can then be calculated for each plant. This curve is based on 75 per cent boiler effi-

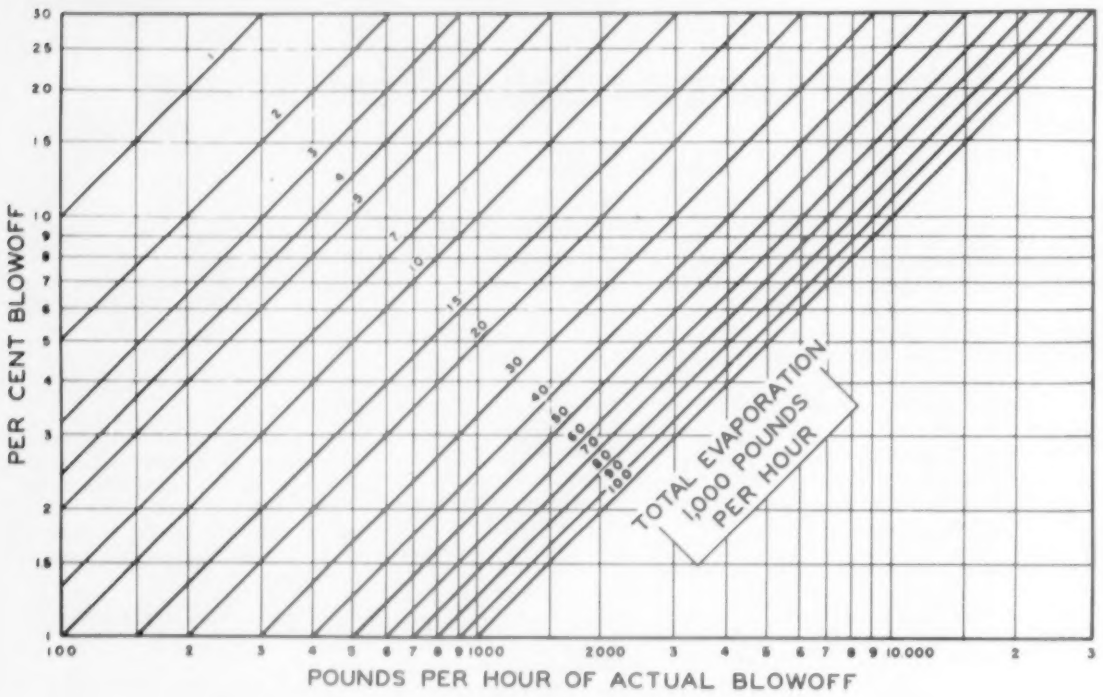
TABLE 1—TOTAL DISSOLVED SOLIDS—ALLOWABLE CONCENTRATIONS—PER CENT BLOWOFF, BASED ON 100 PER CENT MAKEUP

Total dissolved solids makeup p.p.m.	Per cent blowoff of total evaporation and allowable concentration, p.p.m.						
	1,000	1,250	1,500	2,000	2,500	3,000	3,500
10	1.0	0.8	0.7	0.5			
15	1.5	1.2	1.0	0.8	0.6	0.5	
20	2.0	1.6	1.4	1.0	0.8	0.7	0.6
25	2.6	2.0	1.7	1.3	1.0	0.8	0.7
30	3.1	2.5	2.0	1.5	1.2	1.0	0.9
40	4.2	3.2	2.6	2.0	1.6	1.3	1.1
50	5.3	4.2	3.4	2.6	2.0	1.7	1.4
60	6.4	5.0	4.2	3.1	2.5	2.0	1.7
70	7.5	5.9	4.9	3.6	2.9	2.4	2.0
80	8.7	6.8	5.6	4.2	3.3	2.7	2.3
90	9.9	7.8	6.4	4.7	3.7	3.1	2.6
100	11.1	8.7	7.2	5.3	4.2	3.4	2.9
125	14.3	11.1	9.1	6.7	5.3	4.3	3.7
150	17.7	13.6	11.1	8.0	6.4	5.3	4.5
200	25.0	18.8	15.4	11.1	8.7	7.2	6.1
250		25.0	20.0	14.3	11.1	9.1	7.7
300			25.0	17.6	13.6	11.1	9.4
400				25.0	19.0	15.4	12.9
500					25.0	20.0	16.7
600						25.0	20.6
700							25.0

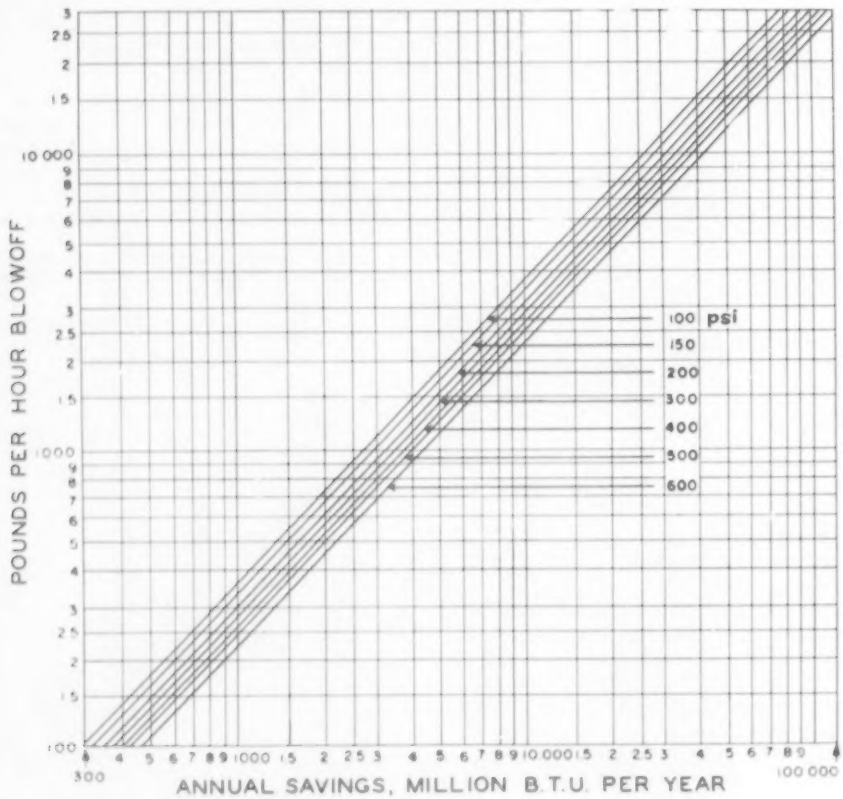
ciency. For other efficiencies, multiply result by proper ratio.

Example:

Boiler pressure, psi.	400
Total dissolved solids in makeup water, p.p.m.	90
Amount of makeup, per cent	100
Total evaporation, lb. per hour	50,000
Allowable concentration, p.p.m.	3,000
From Table 1, blowdown, per cent	3.1
From Fig. 1, lb. per hour blowdown	1,550
From Fig. 2, annual savings, million B.t.u.	5,500



Curve 1 (above)—Per cent blowoff, total evaporation, pounds per hour of blowoff.



Curve 2 (right)—Pounds per hour of blowoff, boiler pressure, annual savings.

ARE YOU KLINGERWISE?

"KLINGERIT 1000"
Wire-reinforced compressed asbestos sheet packing for all uses
Especially made for use with oils and with most hydrocarbons
"KLINGER—OILIT"
"KLINGER—ACIDIT"
RAK
Quality sheet packing for general engineering practice
"KLINGERIT"
Universal compressed asbestos sheet packing for all purposes

USE

Klinger

SHEET PACKINGS

Write for the Klinger Master Catalog which describes the complete range of Klinger products, compressed asbestos sheet packings for all purposes, valves, cocks, level gages, synthetic and silicone rubbers.

FIRST IN 1886 FOREMOST TODAY

RICHARD KLINGER LIMITED, KLINGERIT WORKS, SIDCUP, KENT, ENGLAND

Agents throughout the World

Manufacturing Licensees for Canada

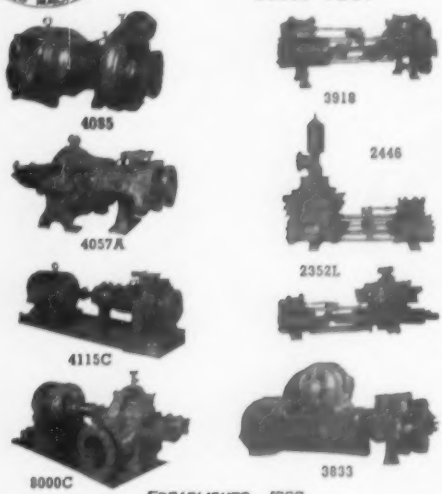
JOSEPH ROBB & COMPANY, LIMITED
5575, COTE ST. PAUL ROAD, MONTREAL, 20, CANADA
Telephone: WILBANK 3181 Cable: ROBCO
Branches at: SYDNEY, N.S., HALIFAX, N.S., OTTAWA, Ont., TORONTO, Ont., HAMILTON, Ont., WINNIPEG, Man., EDMONTON, Alta., VANCOUVER, B.C.

Manufacturing Licensees for U.S.A.

THE KLINGER CORPORATION OF AMERICA
95, RIVER STREET, HOBOKEN, NEW JERSEY, U.S.A.
Telephone: HOBOKEN 2-7915 Cable: KLINGDALE
New York NEW YORK U.S.A.
Telephone: WHITEHALL 3-8996

PUMPS

CENTRIFUGAL
RECIPROCATING
BUILDERS OF OUTSTANDING PUMPS
Since 1869



ESTABLISHED 1869

DEAN BROTHERS PUMPS INC.

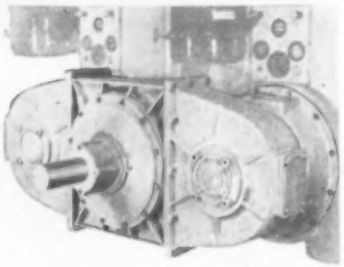
INDIANAPOLIS IND.

323 W. TENTH ST.

HOLD HIS ATTENTION TILL I CAN GET US TO ALEXANDER SHIPYARD FOR REPAIRS!

QUICK, EFFICIENT MARINE REPAIRS

These standard interchangeable combo-power units will save you thousands of dollars!



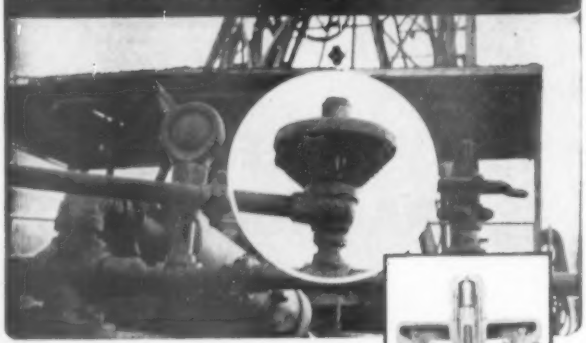
Standard flanges allow a wide variety of combinations for pumps, rigs and service equipment. FUNK POWER ACCUMULATORS combine smaller, low-cost popular engines to obtain required power and torque. 2, 3 or 4 engines may be combined with torque converter or clutch drive in a variety of ratios. Additional shafts may be provided at crankshaft centers, or equipped with right angle drives or gear reductions. Other combinations include POWER DIVIDERS or EXTREME SIDE LOAD POWER TAKE-OFFS.

BEFORE YOU REPOWER OR RE-DESIGN WRITE FOR CATALOG DESCRIBING THESE AND OTHER UNITS.

FUNK combo power **UNITS**

FUNK AIRCRAFT CO.
3319 Airport Drive
Coffeyville, Kansas

FULLY AUTOMATIC PRESSURE RELIEF for mud operations



Kinzbach Model 112 Relief Valve shown in closed position.

The Kinzbach Model 112 Relief Valve provides safer, more efficient pump or pressure relief and greater flexibility in operations than any other valve. It ***snaps open*** for instant pressure relief at maximum volume and ***snaps shut*** to restore circulation instantly and automatically after a predetermined pressure drop. The basic design positively prevents chatter.

Available in 2" and 3" sizes. Write for full technical data. Ask for bulletin 11250.

KINZBACH TOOL CO., INC.
P. O. BOX 277 • HOUSTON 1, TEXAS
Export Office:
74 Trinity Place, New York, N. Y.

KINZBACH TOOL CO INC

Sampling for Continuous Analysis—2

by C. G. Fellows

THIS is how a continuous sampling system for an oxygen analyzer operates. The sample was available at about 15 psig. and 30° C. and the sample line was a 30-ft. length of ⅜-in. o.d. tubing. To deliver a measurable sample to the O_2 analyzer, the sampling system as shown in Fig. 1 (installment No. 1) was constructed. It operates as follows:

1. The sample gas is taken from the top side of a horizontal section of the chemical unit's piping and flows through a ⅜-in. or ½-in. o.d. line to a drip pot wherein a condensate in the sample gas collects. Valves 3, 4, and 5 are normally closed, but, when the condensate needs to be removed, Valves 3 and 4 are opened and it drains to a low-pressure system. During such a time, Valve 5 is used to determine whether the drip pot has been blown free of condensate and also to obtain check gas samples.

2. The sample gas leaving the drip pot travels to point A where it divides, 250 cc. per minute flowing through Valve 1 to the sample system proper. The remainder—say, ½ cu. ft. per minute—constituting a high-velocity sample-line purge, flows through Valve 6 and orifice O_1 to the low-pressure system. A means of checking to determine whether or not orifice O_1 is plugged is afforded by Valve 8—normally open—and the pressure gage ahead of it. When closed, this valve permits pressure to build up between it and point A. If the pressure is indicated on the gage, the orifice is open; if not, it is plugged. If the pressure indicated rises quite slowly, the orifice is probably becoming plugged. This routine check is very important because, when the orifice plugs, too much sample flows into the measuring system, thereby greatly increasing the response time of the system to a change in O_2 content. The actual sample flowing through Valve 1 passes into a spring-loaded type of pressure-reducing regulator R_1 having a large enough diaphragm—7-in. diameter is about right—to assure pressure control to better than ±0.2 in. of water variation at 15-psig. inlet pressure and 6-psig. outlet pressure. From R_1 the sample flows to point C where plug cocks 10 and 11 are located. These are parts of a twin filter-orifice system for further sample conditioning.

3. The twin system is used because at point C some particles of gunky condensates still remain in the sample gas and, despite the use of glass-wool filter, plug up the flow-control orifices O_2 and O_3. Therefore, plug-cock 10, filter F_1, orifice O_2 and Valve 12 comprise one system, while 11, F_2, O_3 and 13 comprise the other. Thus, in operation, one is in use while the other is being cleaned, so that no interruption of sample flow to the analyzer occurs due to plugging of orifices. The sample leaves this filter-orifice system at point E and enters a flow controller FC having a control-pressure connection between D and the upper side of its diaphragm. Thus, with R_1 holding the sample pressure at 6 psig., there can be no change in the rate of flow emerging from FC.

4. From the flow controller, the sample travels upward into a 30-in.-high vertical loop and then down into a liquid scrubber S in which the 20 to 60 per cent by volume variable content of the gas sample is removed. The 30-in. loop is to prevent scrubber liquid from flowing backward into the controlled flow system of the gas sample (this point to be clarified further on).

5. For this particular case, the unwanted sample component was quite soluble in water so that a scrubber of simple design as shown in Fig. 2 was used. It consisted of a piece of 2-in. stainless-steel tubing with a drain valve and an overflow which includes a 24-in. liquid seal to maintain the system back pressure. The gas sample and water enter at the lower end of S and travel upwards through the baffle plates which, because of the surface tension of the water, cause the bubbles to drag across their surfaces, thereby increasing their residence time and the degree of scrubbing effected.

It is important that the gas phase of a scrubber using an overflow system be connected to the overflow line with at least ½-in. tubing to prevent siphoning and to allow entrained gas in the overflowing liquid to escape and thereby prevent intermittent vapor lock. Such vapor lock will cause liquid to rise in the scrubber until the increase in head pressure overcomes that of the vapor lock and the excess liquid then escapes in a rush which pulls in more gas and vapor lock occurs again. These events continue cyclically and the operation of the scrubber becomes erratic.

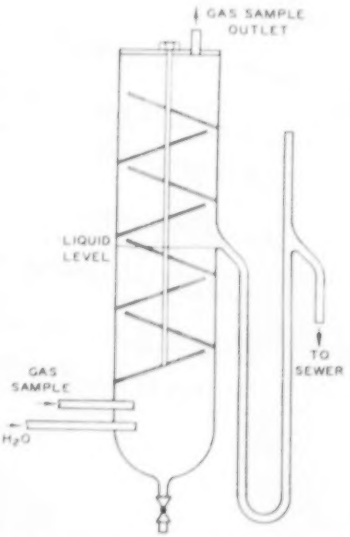
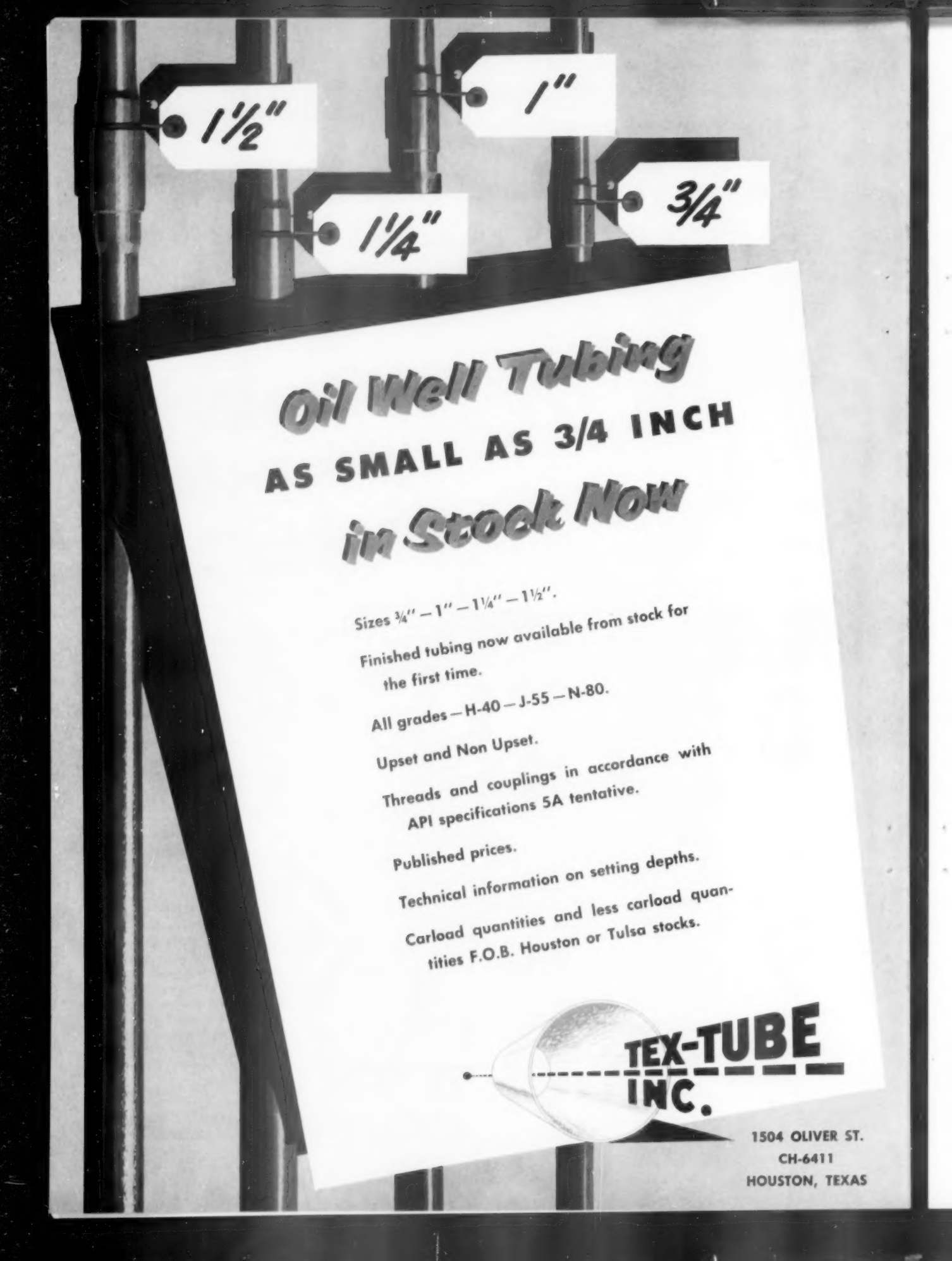


Fig. 2—Liquid scrubber used in continuous sampling system for oxygen analyzer.

Author is with Carbide & Carbon Chemicals Co., South Charleston, W. Va., in special instrumentation department. Paper presented at 1954 Texas A. & M. instrumentation symposium.



Oil Well Tubing
AS SMALL AS 3/4 INCH
in Stock Now

Sizes ¾" — 1" — 1¼" — 1½".

Finished tubing now available from stock for the first time.

All grades — H-40 — J-55 — N-80.

Upset and Non Upset.

Threads and couplings in accordance with API specifications 5A tentative.

Published prices.

Technical information on setting depths.

Carload quantities and less carload quantities F.O.B. Houston or Tulsa stocks.

TEX-TUBE INC.

1504 OLIVER ST.
CH-6411
HOUSTON, TEXAS

Separation of Natural-Gas Liquids—4

by John M. Campbell

IN order to illustrate the effect of the variables in separation, the analyses shown in Table 2 were chosen for discussion. Each of these analyses have the same gallons per thousand content in the propane-plus fraction and have the identical composition of ethane, butane, and pentane. The only difference is in the ratio of propane to the hexane-plus fraction. This was done to illustrate the effect of gas analysis on separation. Although the results do not have general application for recovery purposes, they illustrate that the above ratio has an important bearing. Leaner or richer gases showing about the same ratio would have about the same optimum separator conditions.

Each of the analyses has been examined at separation pressures of 900 and 400 psia., at temperatures ranging from 0° to 100° F. It is the opinion of the writer that separation above 100° F. can seldom be justified since cooling to that temperature is relatively cheap and easy.

Analysis of separator liquid . . . Fig. 5 illustrates the effect of lowering the separator temperature. At decreased temperatures, the increase in the quantity of methane and ethane is far more rapid than the other components. Consequently the fluid becomes lighter and the percentage loss on stage separation increases. The optimum separator temperature therefore is basically one which gives the largest quantity of the desirable components without large quantities of methane and ethane. Consequently the use of low-temperature separation may show no stock-tank advantage even though the quantity of separator liquid increases unless said fluid is properly handled.

Fig. 5 would indicate that the optimum separation temperature for a propane-free product is between 10° and 30° F. At lower temperatures the quantity of lighter products increases very rapidly with no appreciable increase in the quantity of butane and heavier.

Table 3 illustrates the comparative analyses of stabilized and nonstabilized stock-tank fluid. The increased recovery with stabilization may be attributed to the increased percentage of butane and pentane retained in the stock-tank fluid.

Stock-tank recovery . . . Figs. 6 and 7 show the amount of stock-tank

Author is manager of process equipment department, oil and gas division, Black, Sivalls & Bryson, Inc., Oklahoma City. Paper presented at ninth annual short course on gas technology, Texas A. & I. College, June 1954.

TABLE 2—EXAMPLE OF FULL WELL-STREAM ANALYSIS

Component—	Mole per cent— Analysis A	Analysis B
Methane	71.18	70.01
Ethane	15.03	15.03
Propane	4.78	7.42
Isobutane	1.04	1.04
n-Butane	3.43	3.43
Isopentane	0.96	0.96
n-Pentane	1.14	1.14
Hexane	0.92	0.63
Heptanes plus	1.52	0.34
	100.00	100.00
Molecular weight, heptane plus fraction	115	115
Specific gravity, heptane plus fraction	0.71	0.71
Gallons/M.c.f. propane plus fraction	4.64	4.64

TABLE 3—COMPARISON OF STOCK-TANK-LIQUID COMPOSITION

Component—	Three-stage separator	Stabilization
Methane	0.04	
Ethane	0.45	
Propane	3.81	0.31
Isobutane	3.14	9.88
n-Butane	6.54	16.00
Isopentane	5.54	8.19
n-Pentane	4.26	5.54
Hexane	17.04	16.61
Heptanes plus	59.20	43.47
	100.00	100.00

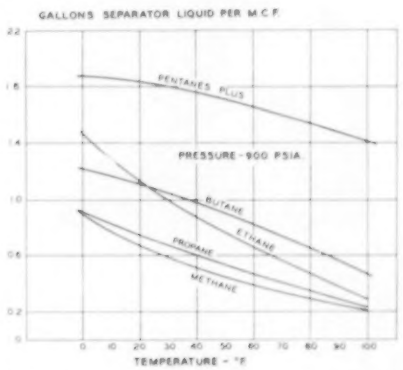


Fig. 5—Quantity of separator fluid for analysis "A" at 900 psia.

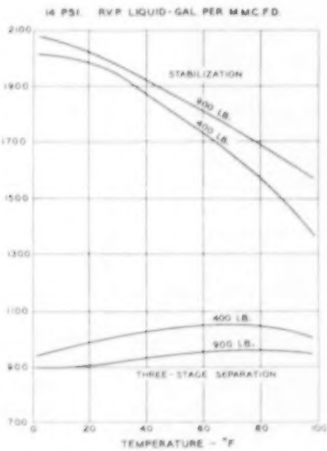


Fig. 6—Quantity of 14 psi. R.v.p. stock tank oil for analysis "A."

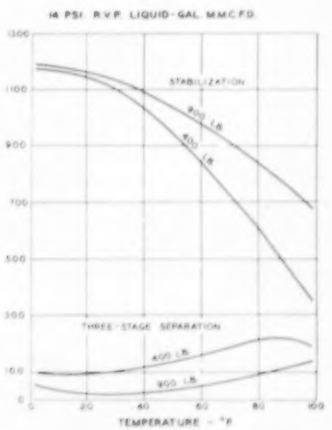


Fig. 7—Quantity of 14 psi. R.v.p. stock tank oil for analysis "B."

liquid obtained by separating the two gases at varying conditions. The recoveries for stage separation were based on using three stages with the stock tank considered as one stage. For the 400 psia. case, the second-stage separator was operated at 80 psia., while in the other 120 psia. was used. In all cases the stock tank was assumed to operate at 98° F. and 14.7 psia.

These interstage pressures were based on the formula:

$$R = \sqrt[n]{P_1/P_s}$$

where:

R = ratio of pressures between stages.
n = number of stages minus one.
P_1 = first stage pressure, psia.
P_s = stock tank pressure, psia.

In reality this formula can only be considered as approximate since it presumes that the pressure drop per stage should be equal. However, in the absence of detailed calculations it is the best now available.

With reference to Figs. 6 and 7, it may be seen that the stock-tank recovery with stage separation is greater at 400 psig., even though more total fluid is obtained in the separator at 900 psia. At both pressures, the recovery of the heavy ends is substantially the same, the difference being in the higher components.

This illustrates that increasing the quantity of light ends and the ratio of pressures per stage in turn increases the flash loss from stage separation. It may also be noted that the recovery by stage separation decreases with the temperature of separation. This results from the increased flash losses in the low-stage separator and stock tank. Actually, when the inherent errors in the calculations are recognized, the only definite conclusion that may be made is that lowering temperature below 70° to 80° F. offers no apparent advantage.

The maximum point occurs because that represents substantial recovery of heavy ends without excess quantities of light ends. The maximum for Analysis A occurs in a lower temperature because of the larger quantity of the pentanes-plus fraction.

If four-stage separation were used in the 900 psia. case, the recovery would be comparable to that shown for 400 psia. separation with only three stages. This particularly illustrates that decreasing the ratio per stage results in higher recovery.

With stabilization, the higher separation pressure results in increased recovery throughout the range, although the curve becomes flatter as the temperature decreases. From these curves it may be seen that little advantage is shown by decreasing the separation temperature below 20° F.

The slope of the curve for Analysis A is less throughout, once again, because of the predominance of heavy ends. As the quantity of these becomes even larger, the curve would flatten and the recoveries from stabilization and stage separation become closer. Consequently the value of stabilization is contingent primarily on separator-liquid composition. In this regard stabilization can normally be justified if low temperature separation is economically attractive.

Air Inlet Eases Load, Cuts Costs

AIR passages between strips of insulation on hot condenser lines are used to ease the load on the condenser coils at Taylor Oil & Gas Co.'s McAllen, Texas, cycling plant.

The method, suggested by Plant Superintendent L. M. Finch, not only aids the condenser but reduces rigging and painting costs on the line by making it possible to hold a coat of paint on the insulation covering. Previously, the exposed hot line had caused the paint to blister.

The lines where this system is used are those carrying overhead vapors from a tower to its condenser. Insulation is laid in three strips which are parallel to the line and which provide three air channels between them. An outer covering of aluminum or other metal is made around the insulation, extending

from flange-to-flange, as does the insulation. Consequently, a draft occurs in the three air channels between the condenser line and the outer covering. This serves to provide a certain amount of cooling to the vapors carried by the line.

Handy Rack Simplifies Testing

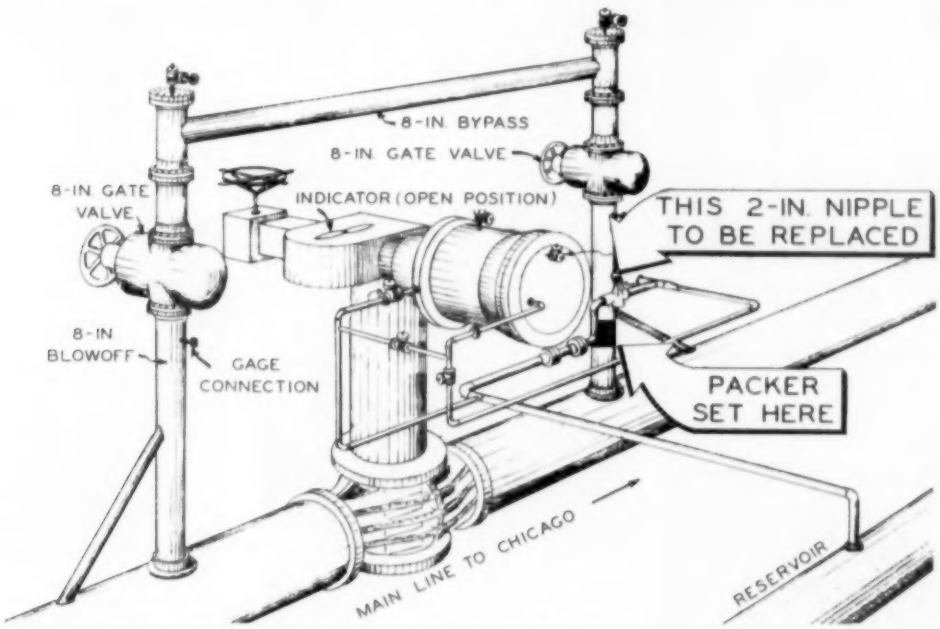
A HANDY test rack for compressor magnetos can be simply built which will have the advantage of testing both left-hand and right-hand magnetos.

The rack consists merely of two rectangular pieces of plate steel welded together with vertical angle-iron supports at each corner. The space between the two plates is governed by the physical size of an electric-drive motor which is bolted to the lower plate.

The upper plate has a slot cut in it to accommodate a V-belt. This belt, which is driven by the electric motor, drives a pulley mounted on a small shaft which is supported by blocks straddling the slot. At either end of the shaft couplings are located to connect the magnetos to the shaft. The magnetos themselves

are bolted to a raised platform during tests.

The entire rack is bolted to a table so that it will be at a convenient height. The rack was suggested by Irvin E. Mountcastle, LaGloria Corp., Falfurrias, Tex.



HERE'S WHERE the alterations were made in the automatic valve installation to correct a specification error. Fig. 1.

Oil-well packer solves gas-pipeline problem

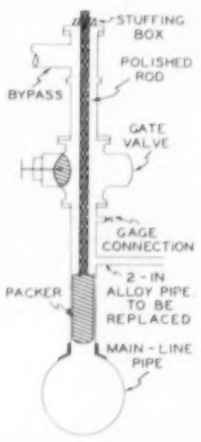
AN oil-well packer has been adapted to gas-pipeline use by Texas Illinois Natural Gas Pipeline Co. This packer permits the removal and replacement of inadvertently installed and unsuitable alloy pipe without interfering with normal gas transmission.

A series of leaks and weld failures occurred in the 2-in. piping to the pressure - differential - controlled automatic valves on the Texas-Illinois line. Examination of the 2-in. pipe revealed that it was not the specified Grade B double-extra-strong seamless pipe, but a high-alloy pipe that is extremely brittle when welded by ordinary procedures. The substitution of the alloy pipe for the specified pipe was not detected during construction and the welding procedure was the same as regularly used on Grade B pipe.

A check of surplus pipe at various locations showed that the alloy pipe had been distributed the whole length of the line. Tests disclosed that 15 of 22 station - pressure - gage connections and 83 of 118 automatic-valve installations had high-alloy pipe between the main line and the first piping valve.

Potential hazard . . . The brittle welds of the high-alloy pipe constituted a potential hazard of major importance because of threatened service interruption. It was especially dangerous at the station connections because repair of a damaged station is expensive, and service is interrupted for long periods of time.

The station connections were replaced immediately by means of main line shutouts but such a procedure would have been much too costly in loss of gas, time, and money to be used for all 83 automatic-valve installations. A method was devised to avoid these losses. An oil-well packer was installed through the blowoff gate valve in the bypass installations (Fig. 1). The rubber packing element was set in the blowoff pipe just above the top of the main line and below the 2-in. side connection which was to be removed (Fig. 2).



HERE'S HOW the rubber packing element was set in the blowoff line. Fig. 2.

A detector or gage was run through all blowoffs before running the packer to determine if inside projections would prevent using the packer. After setting the packer, the blowoff piping was blown down and the 2-in. connection was replaced by cutting out the old connection and replacing it with a 3 by 2-in. swage nipple.

Two sizes of blowoff connections, 6-in. and 8-in., required removal of alloy pipe. Two 7-in. packers for the 8-in. blowoffs and one 5-in. packer for the 6-in. blowoffs together with the necessary polish rods and stuffing boxes were sent to a field location for testing under 860 psi. and work-procedure development.

Handling mechanism, including a 31-ft. boom on the Caterpillar tractor and a steel operating platform, was con-

. . Conquest

Men, methods and machines function as well ordered team for efficient construction of pipe lines.

HOUSTON CONTRACTING CO. LTD.
General Contractors
OIL • GAS • GASOLINE • WATER PIPE LINES
2707 FERNDALE • HOUSTON 6, TEXAS
GENERAL PARTNERS
LAURENCE H. FAVROT • R. P. GREGORY
ASSOCIATE
GEORGE A. PETERKIN

POSITIVE OIL SHOW IDENTIFICATION
with MINERALIGHT Ultra-Violet (black light)
Don't pass us possible pay! Make positive core identification checks with new model MINERALIGHT SL long wave ultra-violet lamp.
PROVED BEST BY TEST FOR OIL SHOW ANALYSIS! Simple to operate. Lamp weighs only 1 lb. Models available for 110 volt AC or with adapter, 110 volt DC current. Battery operated model for field use holds lamp, has built-in viewer for daylight examination. Easily portable. Send for FREE brochure OG, "How to detect and analyze petroleum in oil surface samples with ultra-violet."

ULTRA-VIOLET PRODUCTS, Inc.
145 Pasadena Avenue South Pasadena Calif.

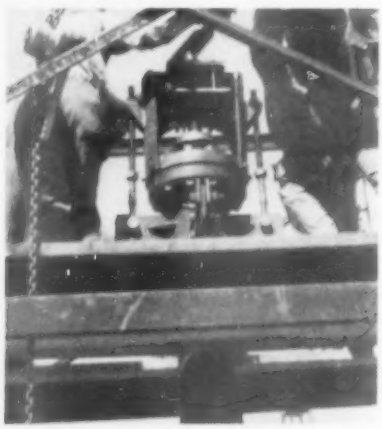
THE
PARCO COMPANY
INCORPORATED
PARCO
DESIGN PERTAINING TO ALL PHASES OF
Power, Petroleum and Chemical Plants
82 Beaver Street, New York 5, N. Y.

PIPELINE PATROL

READY to lower, the packer hangs above the blowoff while the unattached chain hoists dangle around it.

POSITIONED in the blowoff and with chain hoists attached and tightened for pull, the packer starts on its way down.

HALFWAY DOWN, the packer is forced through the gate valve by the hoists.



SET by a manpower, the packer expands to seal the blowoff from line pressure.

structed and operating procedures were worked out.

Repair procedure . . . The procedure for actual repair is this: The bypass portion of the valve unit is blown down through a small valve and the blind flange removed. A spool of the proper length is bolted on the top flange of the bypass. The packer is set in the spool and blowoff above the gate valve. The chain hoists, which are connected on the top assembly, are hooked on a casing clamp around the spool, which is below the stuffing box.

The bypass is repressured and the blowoff valve is opened. Then the packer is pulled down through the blowoff valve into the approximate setting position by means of the four hoists. The yoke assembly is bolted to the flange of the stuffing box. The packer is set by manpower using a long wrench on the actuating screw to expand the rubber and fill the annular space between the metal part of the packer and the inside wall of the blowoff, thus completely sealing the blowoff from line pressure.

The bypass piping is blown down and water is injected into the blowoff through the gage connection. This protects the rubber packer from sparks, keeps the packer cool during cutting and welding operations, and helps determine when leakage has been stopped.

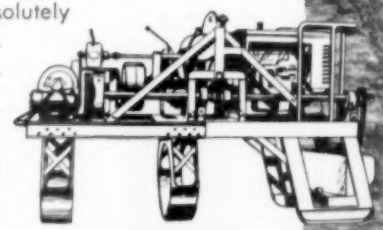
You don't have to stop traffic . . .

. . . to bore road crossings

with the **CROSE** *auger-type*

ROAD BORING MACHINE

Installs casing as boring progresses — eliminates cave-ins. Absolutely prevents settling of concrete slab highways or railroad beds. Extremely accurate in alignment. Adaptable to all sizes of casing from 3" to 34".



M.J. **Crose** *Manufacturing Co., Inc.*

2715 DAWSON ROAD • TULSA, OKLAHOMA

BRANCH OFFICES: HOUSTON • NEW YORK • NEWARK
EDMONTON • DENVER

WATER STAYS

COOLER . . . FRESHER . . . PURER

IN *Gotkool* **WATER CANS AND COOLERS**

"Gotkool's" exclusive construction keeps water cool, pure and fresh for a long time. Extra wide, snug-fitting, splash-proof top keeps out impurities. Non-leaking, push-button faucets. Ask for "Gotkool," by name at your supply store today.

GOTKOOL WATER COOLER
Made in 2-, 3-, 5-, 8-, 10-, 15- and 20-gallon sizes with extended or recessed push-button faucet optional. *(Note:* 15- and 20-gallon sizes available with extended faucet only.)

GOTKOOL WATER CAN
Made in 1½-, 2-, 3-, 5-, 10-, 15- and 20-gallon sizes without faucets. Extended or recessed push-button faucets available at slight additional cost. *(Note:* 15- and 20-gallon sizes available with extended faucet only.)

KEEP PURE DRINKING WATER ALWAYS HANDY

INSIST ON THE GENUINE . . . Look for the Blue and Black Label With the Name GOTKOOL in Red.

H. P. GOTT MFG. CO.
WINFIELD, KANSAS

Oil Loans

THE 1ST NATIONAL BANK OF SHREVEPORT

OLDEST BANK

Pipeline Patrol

When the leakage is stopped, the weld reinforcing saddle on the blowoff pipe is cut off and the pipe surface is ground smooth with an electric grinder. The 2-in. alloy nipple is cut out and the cut in the pipe is made to fit a 3-in. swage. A 3 by 2-in. swage nipple of proper length, together with a new welding saddle, is fitted and welded in place. Then the bypass is repressured and the packer released by means of the actuating screw. The yoke is unbolted and the hoists replaced in position.

The packer is raised through the blowoff valve by gas pressure due to a difference in the effective cross-sectional area on the top and bottom of the packer. Then the valve is closed. The hoists prevent the packer from blowing against the stuffing box in traveling up the blowoff. Final steps include blowing down the bypass piping; unbolting the stuffing-box flange; withdrawing the packer from the blowoff; and removing the spool. The blind flange is replaced and the bypass repressured, thus completing the repair job.

Variations . . . The procedure on all valves was similar, but the repair job didn't develop into an exact science. No blowoff connection was exactly the same. Layouts varied due to minor differences in alignment of welds. Welding icicles inside the blowoff were of vital importance and frequently had to be ground or cut off. On occasion, the detector went through when the packer would not because of projections inside the blowoff.

Other factors to be considered included the weld alignment on spools and the slope of the pipe and the ground level.

Furthermore, the operation of the hoists had to be synchronized and the operation of the packer had to be watched closely to prevent freezing of the swivel head. This could distort the rubber and make release and withdrawal difficult.

Work schedule . . . The whole operation was done under the personal direction of a district superintendent who could make on-the-spot decisions as to whether the packer could be used or a shutout was required.

As the work schedule progressed through the pipeline sections and districts, workmen, welders, foremen, engineers, and superintendents were brought into the crew and trained in the procedure before relieving the men from the area previously covered. Practically all the company's pipeline department personnel participated in the project.

The repairs were completed with a minimum of disturbance to regular operations (there was one on-the-spot scheduled shutout of 3½ hours) and the work was performed as safely and quickly as possible considering the type of work.

Gas loss is estimated to have amounted to 895 M.M.c.f. had the shutout method been used. The field cost alone of this amount of gas is considerably more than the total spent in developing the equipment and making repairs.

THE AUTHOR

Hugh E. Smith is field superintendent of pipelines for Texas Illinois Natural Gas Pipeline Co., which position he has held since 1951. Prior to that time, Smith served with Cities Service Pipe Line Co., Empire Gas & Fuel Co., Continental Construction Co., and Natural Gas Pipeline Co. of America. He has been a pipeliner since 1917.

a precision instrument

H & M Pipe Cutting and Beveling Machines are designed and manufactured to high engineering standards. Close tolerances in gear design consistently give cleaner, more accurate cuts, yet the H & M is rugged and will withstand years of tough field use.

for pipe cutting and beveling

A complete line of beveling machines is available from H & M. The #1 machine will cut and bevel pipe as small as 4", the #5 machine will handle a diameter of 36". Once in place the entire 360° cut can be made in a matter of minutes with an effortless turn of the hand crank.

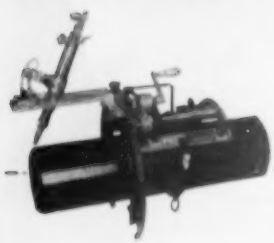
and

now lightest in its class

A new metal manufacturing process has recently made the H & M the lightest beveler in its class . . . has actually reduced the weights of the number 3, 4, and 5 machines by 40%. Think of what this means in the field—new lightness without any loss of durability.

gives you the most for your money

Point for point the H & M gives you more. It is actually possible to save one-half your labor and gas cost by using the H & M Pipe Cutting and Beveling Machine. Attachments are available for out-of-round and shape cutting. For more information, write H & M.



H&M PIPE BEVELING MACHINE COMPANY

U. S. Trademark Reg.

311 E. THIRD • TULSA, OKLA. • PHONE 3-0241

REFINING

Tank Vapors Cut

Los Angeles refiners meet county smog regulations

LOS ANGELES.—All 14 Los Angeles County refineries having Class 2 gasoline storage tanks completed construction of smog-control equipment well in advance of the August 1 deadline, the County Board of Supervisors has been advised.

Installation of vapor-recovery equipment or floating roofs on Class 2 tanks means that all large tanks for storing cracked gasoline are completely under control. Class 1 tankage, tanks of 400,000 gal. and larger, had been so equipped well before the deadline.

Of the total capacities of Class 3 tanks over 400,000 gal., used for distillate other than cracked stocks, 75 per cent will be completed at least a month before the February 1, 1955, deadline.

Although the deadline for Class 4 tanks (less than 400,000 gal., for distillates other than gasoline) is not until May 1, 1955, 50 per cent already have been controlled. All will be controlled well before the deadline, it is anticipated.

Cost of the project, which became mandatory when a control law was adopted in late April, has been placed at $7,000,000.

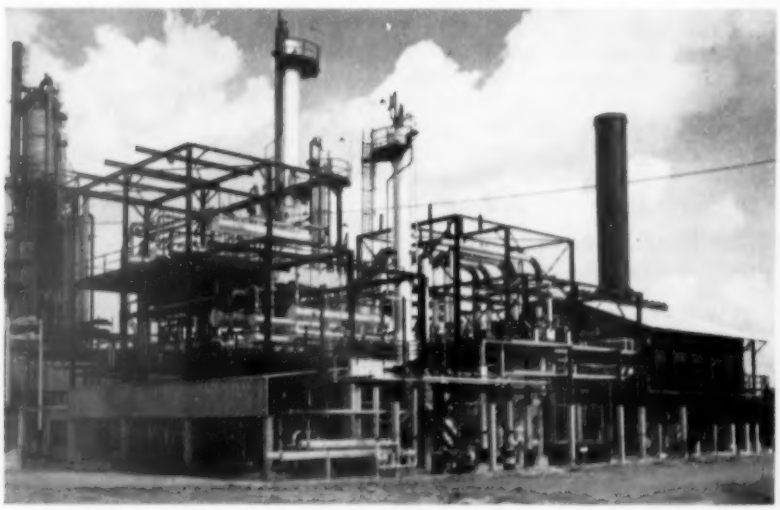
The report said the volume of gasoline vapors escaping from refineries and storage facilities has been reduced. However, it added, there is still pressure for solution of two other problems: Development of a practical method of controlling automobile exhausts, and adoption of a county-wide trash collection plan.

Atlantic Announces Five More Catformers Licensed

PHILADELPHIA.—Two small domestic Catforming units have recently been licensed by The Atlantic Refining Co. Canal Refining Co., of Tulsa, has contracted with Midwestern Constructors, Inc., to build a 750-bbl. per day catalytic reformer at the Church Point, La., refinery. At Gladewater, Tex., Gladewater Refining Co. will add a 600-bbl. per day Catformer to the 2,500-bbl. per day refinery.

In addition, Atlantic has licensed three foreign refiners to build and operate Catforming units. British American Oil Co., Ltd., will add a 2,000-bbl. per day unit at the Calgary refinery. This will be the first catalytic reformer in western Canada.

Chinese Petroleum Corp. will add



First Commercial Ultraformer Completed

The first commercial Ultraformer to be built has gone on stream at Pan-Am Southern Corp.'s El Dorado, Ark., refinery. The process, developed and licensed by Standard Oil Co. (Ind.), uses a platinum-based catalyst which is restored to full activity and selectivity at intervals varying from a week to a few months depending on the severity of the operation and the age of the catalyst. Lummus Co., New York, completed construction in only 147 working days and received a 46-day bonus for completing the unit ahead of schedule.

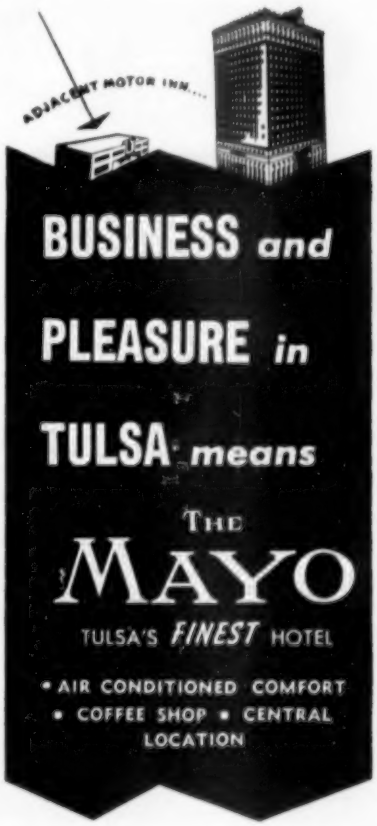
NATIONAL AIROIL
FUEL OIL - GAS
BURNERS SERVING INDUSTRY FOR 42 YEARS

- Steam Atomizing Oil Burners
- Mechanical Atomizing Oil Burners
- Low Air Pressure Oil Burners
- Rotary Oil Burners
- Industrial Gas Burners
- Combination Gas and Oil Burners
- Tandem Block Combustion Units
- Fuel Oil Pump Sets
- Refractory Burner and Muffle Blocks
- Valves, Strainers, Furnace Windows

Detailed information gladly sent you upon request, on your business letterhead.

Established 1912 — Incorporated 1917

NATIONAL AIROIL BURNER COMPANY, INC.
1236 East Sedgley Ave., Philadelphia 34, Pa.
S. W. Division: 2512 So. Blvd., Houston 6, Texas



BUSINESS and PLEASURE in TULSA means
THE MAYO
TULSA'S FINEST HOTEL
• AIR CONDITIONED COMFORT
• COFFEE SHOP • CENTRAL LOCATION

IRON SPONGE

for high efficiency gas purification at high pressures

Iron Sponge is your key to sulfur-free gas at minimum processing cost. Iron Sponge has high efficiency at low pressures or at today's high pressures and high temperatures. It absorbs *more* H_2S, gives long service between foulings, and is easily regenerated. Investigate it for your purification problem today!

CONNELLY Inc.

3154 S. California Ave., Chicago 8, Ill.
Elizabeth, N.J. • Los Angeles, Calif.

INSURE AGAINST CORROSION!

PREVENT COSTLY DAMAGE! CHECK EXISTING RUST!

You'll find VEGO CHEMICAL BLACK is your best insurance against the damaging, costly effects of corrosion—not only for sealing steel and other metals against rust, but also for penetrating existing rust down to the metal and sealing it against further corrosive action! It is also excellent for waterproofing. Easy to apply, VEGO CHEMICAL BLACK forms a continuous protective bond that expands and contracts with surfaces to which it is applied.

- Easy to apply—spray, brush or dip.
- Available in 55, 30 and 5 gal. drums; 1 gal. cans, four to a carton.
- Needs no stirring—stays in constant suspension. Will not skin.

CHEMICALS & MATERIALS CORP., TERRE HAUTE, IND.

VEGO® PRODUCTS OF QUALITY FOR INDUSTRY CHEMICAL BLACK

a 2,000-bbl. per day unit at the 15,000-bbl. per day refinery located on the island of Formosa. The fifth unit recently licensed is a 500-bbl. per day plant which I.L.S.E.A. will add to its refinery in Como, Italy.

Sunset Eyes Oregon As Site For 20,000-Bbl. Refinery

LOS ANGELES.—Sunset Oil Co. is contemplating the construction of a 20,000-bbl. refinery at Portland, Ore., J. D. Sterling, president, announced at a recent luncheon meeting of the Petroleum Press Club here. Site for the plant has been taken under option.

Sterling also brought out that his firm, a large independent producer and refiner, which markets in four West Coast states, last week expected to receive a 135,000-bbl. shipment of 95-octane gasoline from Suntide Refining Co.'s Gulf Coast plant. The gasoline will be used to upgrade gasoline produced in the company's 12,000-bbl. Los Angeles refinery or that is purchased locally. Currently Sunset is buying about 80 per cent of its gasoline supplies, he stated.

Carbide & Carbon Plant Proceeding on Schedule

TORRANCE, Calif. — Carbide & Carbon Chemicals Co. is proceeding on schedule with its polyethylene, ethylene oxide - glycol plant which it is building here according to H. B. McClure, company president.

McClure made the announcement in answer to rumors that plans for the Torrance plant had been temporarily shelved.

The plant will be the first on the West Coast to manufacture polyethylene and ethylene glycol.

Brea Starts Construction On Petrochemical Plant

LOS ANGELES.—Construction has started on new ammonium phosphate facilities at the Brea Chemical, Inc. plant here. Completion is scheduled for late September, with the work being done by Macco Corp.

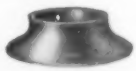
The company's $13,000,000 ammonia plant was placed in operation in late June and about July 1 the adjacent carbon dioxide plant went on stream. Production of dry ice at Brea plus that from its Santa Maria plant is averaging about 150 tons daily, making the wholly owned Union Oil Co. subsidiary the largest producer in the West.

See Composite and Refinery Catalogs, or Write for Folder On

FLEET-LINE

PIPE SADDLES AND REDUCERS

Nozzle sizes from 1/4" to 24" — ASTM A234



Also for pressure vessel heads

Nominal pipe sizes 1" to 30" — Special sizes, lengths, schedules

ASA B16.9 ASTM A234 — Eccentric

Immediate Delivery

STEEL FORGINGS, Inc.

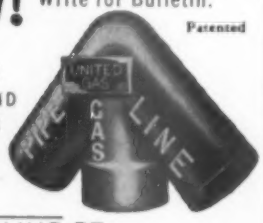
P. O. Box 2768 • Shreveport, La.

Foot of Fannin Street

NEW! Write for Bulletin.

Patented

PIPELINE VENTS AND MARKERS



FLEET-LINE CO.

P. O. BOX 2768

SHREVEPORT, LOUISIANA

Write or Wire for Monthly Stock Lists

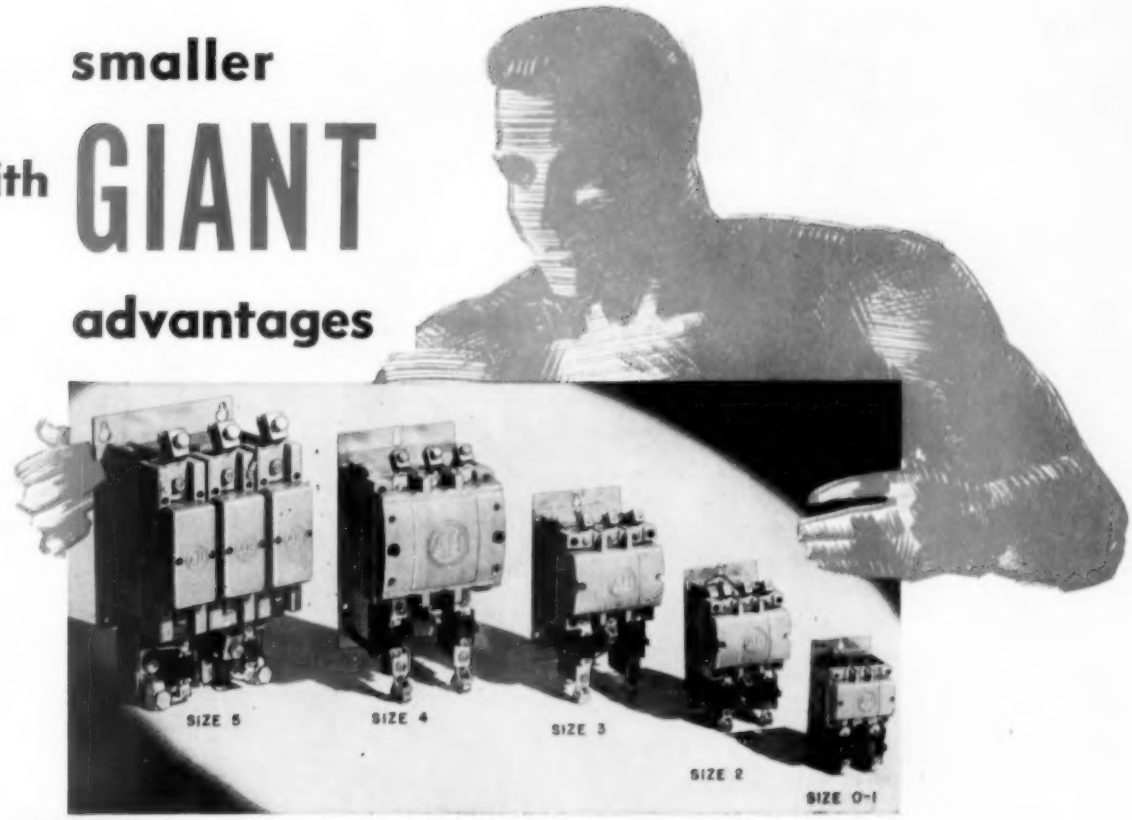
- VALVES
- PRESSURE TUBING
- STEEL

Peerless Supply Co., Inc.

L. D. 75 & 76 P. O. Drawer 36-A

Shreveport, La.

smaller with GIANT advantages



ARROW-HART Type "RA-V" Magnetic Motor Starters

(WITH VERTICAL OVERLOADS BELOW THE CONTACTOR)

Arrow-Hart Type "RA-V" Magnetic Motor Starters step out of their size and weight class (radically lighter and smaller than any others of equal rating on the market) to lick competition in performance, dependability and time and cost saving features.

PERFORMANCE . . . is unsurpassed because only Arrow-Hart Motor Starters have the "RIGHT ANGLE" Operating Mechanism that makes possible maximum performance in minimum space.

DEPENDABILITY . . . is unmatched because sturdy contacts are built of heavy copper with special silver alloy tips that can stand up under severe punishment . . . the coil features a new design of molded construction that provides an impenetrable protective shell to withstand adverse atmospheric conditions . . . and, positioned below the contactor, bi-metallic overload relays with a thermal inverse time delay action provide positive protection.

TIME AND COST SAVINGS . . . unequaled because smaller, lighter motor starters mean smaller, less costly condulets, faster, easier installation and maintenance, lighter, smaller supporting racks, and overall space savings that are reflected in lower building costs.

SINCE 1890

ARROW • HART
INDUSTRIAL CONTROL DIVISION
103 HAWTHORN ST., HARTFORD 6, CONN., U.S.A.

Offices, sales engineers and warehouses in: Atlanta, Boston, Buffalo, Chicago, Cincinnati, Cleveland, Dallas, Detroit, Houston, Indianapolis, Los Angeles, Milwaukee, Minneapolis, New York, Philadelphia, Pittsburgh, St. Louis, San Francisco. **In Canada:** Arrow-Hart & Hegeman (Canada) Ltd., Mt. Dennis, Toronto. **In England:** Arrow Electric Switches, Ltd., Ealing, London W5.

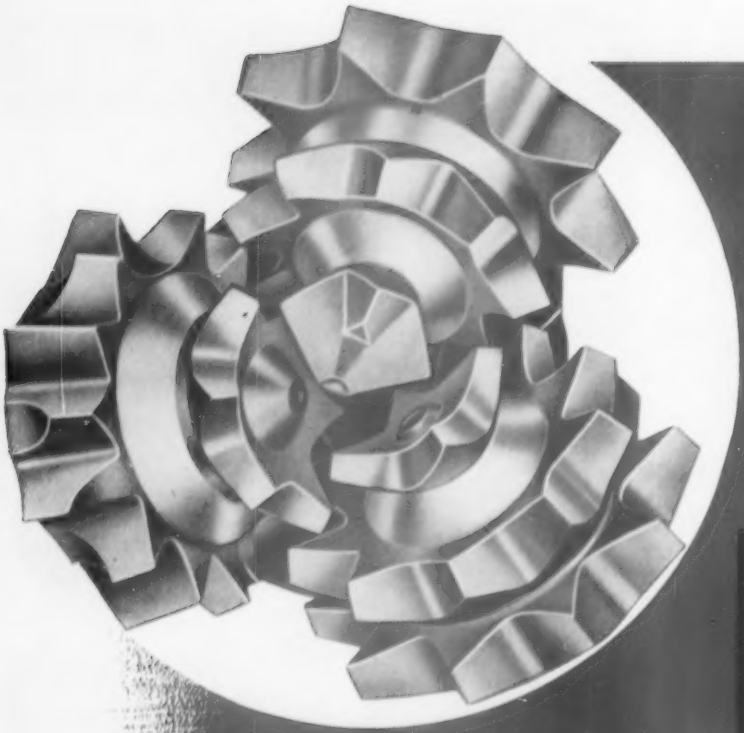
Quality MOTOR CONTROLS • WIRING DEVICES
ENCLOSED SWITCHES • APPLIANCE SWITCHES

INDUSTRIAL CONTROL DIVISION
THE ARROW-HART & HEGEMAN ELECTRIC CO.
103 HAWTHORN STREET, HARTFORD 6, CONN.

☐ *Please send my free copy of the "RA-V" Bulletin.*
☐ *Also, send folder that explains why A-H Oil Field Pumping Panels are my best buy.*

NAME _____
POSITION _____
COMPANY _____
CO. ADDRESS _____
CITY _____ ZONE _____ STATE _____

OGJ



More and more operators are finding that

H. C. SMITH BITS

deliver maximum drilling service because of these construction features:

- all-forged parts
- triple-bearing construction
- hard-faced cutter teeth
- precision-cut tool joint threads
- heat treated for maximum strength

- every bit as good as the best

H C Smith
OIL TOOL CO.

BRANCHES IN ALL PRINCIPAL OIL CENTERS IN THE UNITED STATES AND CANADA

GENERAL OFFICES, EXPORT OFFICES AND PLANT: COMPTON, CALIF.

Among the Drilling Contractors

Deep Pennsylvania Test Drilling With Third Rig

Don Slape Drilling Co., Olney, Ill., is continuing to make hole on the deep wildcat test it is putting down under contract for Benedum-Trees Oil Co. on Broad Top mountain, near Robertsdale, northern Bedford County, Pennsylvania.

The test, 1 Rock Hill Coal Co., now drilling below 11,000 ft. in Marcellus shale, is being carried to the Oriskany (Devonian) sand, expected around 11,500 ft.

Drilling has been under way since drilling to such an extent that operators decided to switch to rotary tools. In the cable-tool drilling, two abandoned mine shafts, one at 160 ft. and the other at 210 ft., were penetrated, and 14-in. casing run through them to 250 December 15, 1952. Present rig is the third which has been on the hole.

Hole was drilled to 2,650 ft. with cable tools, operated by E. M. Shields Drilling Co., Butler, Pa. At that depth, excess water in the hole had slowed ft. This string was followed with 10-in. casing set at 900 ft.

Contract for rotary drilling was awarded the present contracting company which moved in late in September 1953 with a National 50 rig. Drilling was delayed until October 19 when it was found that the 10-in. casing had parted at 340 ft., necessitating a fishing job to recover the pipe, and rerunning and cementing a new string.

The National rig took the hole to 9,250 ft., where, because of the depth, it was necessary for the contractor to move in a heavier rig, a Wilson Titan, which now is on the hole. During the drilling with the lighter rig, numerous zones of exceptionally hard sandstone were penetrated from 7,450 ft. to 7,800 ft. One drill-stem test, at 5,725-5,832 ft., was run with no blow. Thirteen coal seams have been encountered.

Drilling continued uninterrupted during winter months with temperatures as low as 18° F. below zero, although the rig was not winterized.

Titan rig being used by Don Slape Drilling Co. on deep Pennsylvania test.

Penrod Drilling Co., Shreveport, is on a new 13,500-ft. test being drilled for Caroline Hunt trust in Assumption Parish, Louisiana Gulf Coast. Location is at 1 Brownell-Kidd, in 25-13s-12e, about 4 miles west of East Lake Verret.

Glendale Drilling Co. is keeping a rig working for Davidor & Davidor, of Oklahoma City, in the new North Sweet Home pool, in Lincoln County, Oklahoma. Current operation is 2 Delphon. The new area, in 22-15n-3e, is about 5 miles northwest of Chandler. Production is from lower Skinner sand below 4,300 ft.

Saber Drilling Co. is scheduled for a 5,400-ft. wildcat test to be drilled for Davidor & Davidor, of Oklahoma City, at 1 Harris, in 15-16n-2e, 3 miles east of Merrick, in Lincoln County, Oklahoma. Location is 3½ miles southeast of North Merrick pool, nearest production.

Marshall Young, Houston, has taken on a directional drilling job, involving a test to a subsurface location under the Mississippi River. Location of the test, to be drilled for Lamson, Bennett & Cole, independent operators, Lafayette, La., is about 8 miles down the river from Baton Rouge. The deflected hole will be started in an old vertical

bargain thread dope?

Is cheap thread dope really a bargain? Tool joint and drill collar thread wear can cost a lot over a year's time. Fishing jobs come plenty high. Galling or washouts mean hundreds of dollars of extra expense. 'Bestolife Lead Seal stretches thread life, cuts down on fishing jobs, galling and washouts. That's why it's the most widely used lead base thread compound in the world. Get 'Bestolife at your supply store. In 1¼, 5, 20 and 50 lb. cans. Unconditionally guaranteed.

I. H. GRANCELL
1601 EAST NADEAU STREET
LOS ANGELES 1, CALIFORNIA

An ALL-NEW mudline valve

Because . . .
Rockwell Built

MUDWONDER'S

stainless steel stem lasts the life-time of valve and is separate from hard chrome gate, MUDWONDER has a . . .

TWO PIECE PADDLE

Ask your favorite oil field supplier about it today.

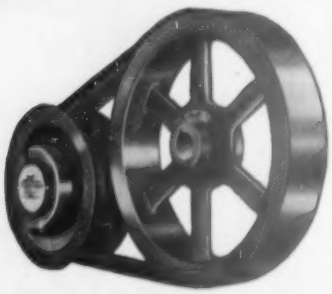
Edward Valves, Inc.
Subsidiary of ROCKWELL MFG. CO.
1492 W. 145th STREET
EAST CHICAGO (phone 231)
INDIANA

SAVE MONEY By Using INFERNO Firing Controls

Inferno Firing Controls save fuel. This is accomplished by keeping steam pressure accurately at the desired level, thus eliminating wasteful popping-off. Actual tests show savings of from 10% to 30% on fuel bills. Write today for a free copy of Bulletin 8-C.

THE INFERNO CO.
Box 1138A
115 RICOU St.
SHREVEPORT, LA.
INFERNO

Where minute speed adjustment is needed . . .



Specify Wood's New Variable Speed Drive

Here's an economical variable speed drive that can be adjusted for infinitely variable speed within its range. By simply turning an adjusting screw on either side of the variable pitch sheave, both flanges move simultaneously and speed changes are obtained quickly and easily.

Positive clamping of the two adjustable flanges eliminates fretting corrosion. Single wide range belt for motors 5 to 20 horsepower provides speed range ratios up to 3 to 1 . . . no lubrication . . . less shaft overhang . . . much less vibration than multiple groove variable speed drives because there's no matching of belts . . . sensibly priced and economical in operation . . . send for Bulletin 796 for detailed information.

T. B. Woods SONS COMPANY
1117 W. COMMERCE ST., DALLAS, TEX.

hole drilled by Shell Oil Co. on the west bank of the river, in West Baton Rouge Parish. Shell's test, 1 Australia Planting, was abandoned at 11,009 ft. The deflected hole will be drilled as 2 State Lease 1909.

E. F. Wakefield, Wichita, Kans., has a new wildcat operation under way for H. H. Blair at 2 Seacat, in 25-33s-4e, a mile east of the Seacat pool in southwestern Cowley County, Kansas. Hole will be carried to the Simpson sands, expected by 4,500 ft.

Brinson Drilling Co. is drilling a 2,600-ft. Delaware sand test for Trico Exploration Co., of Midland, Tex., at a wildcat location, 1 Northrup, about 4 miles south of Tunstill field, in northern Reeves County, far-western Texas. Cable tools are being used.

Gene Reid Drilling, Inc., Bakersfield, Calif., has entered the new Eocene development at Dagany Gap, in Pyramid Hills, Kings County, California, where it is drilling under contract for Universal Consolidated Oil Co. Its first job is 1 S. F. & F. L., in 10-25-18.

R. L. Gibson Drilling Co., Kilgore, Tex., has a rig running on a wildcat test a mile west of Waskom field, in Harrison County, East Texas. It is a contract job for John E. Protho. The test, 1 Furrh, in the J. Mathews Survey, is projected to 6,800 ft.

Terminal Drilling Co., Los Angeles, is rigged up for a 6,500-ft. wildcat test it has contracted to drill for Robert S. Lytle in the North Moorpark area, in Ventura County, California. The test, on acreage farmed out from Humble Oil & Refining Co., is on the Sespe trend of production.

Crow Drilling Co., Shreveport, is under contract for another well to be drilled for Sun Oil Co. in the latter's new Kinder field, in Allen Parish, southwestern Louisiana. The new operation is 1 Edwards estate, in 23-6s-5w. It is contracted to 8,200 ft.

R. H. Gracey, Houston, has a new operation under way for Union Oil Co. of California in the Lake Hatch area, Terrebonne Parish, coastal Louisiana. It is Union's 13-B L. L. & E., in 7-18s-16e. Contract is for 9,000 ft.

Longhorn Drilling Corp., San Antonio and Three Rivers, Tex., is drilling on a new 8,500-ft. wildcat test 10 miles north of Alice, in Jim Wells County, South Texas. It is a contract job for Gust Tsesmelis at 1 Canales, in Share 1, La Tinaja de Lara Survey.

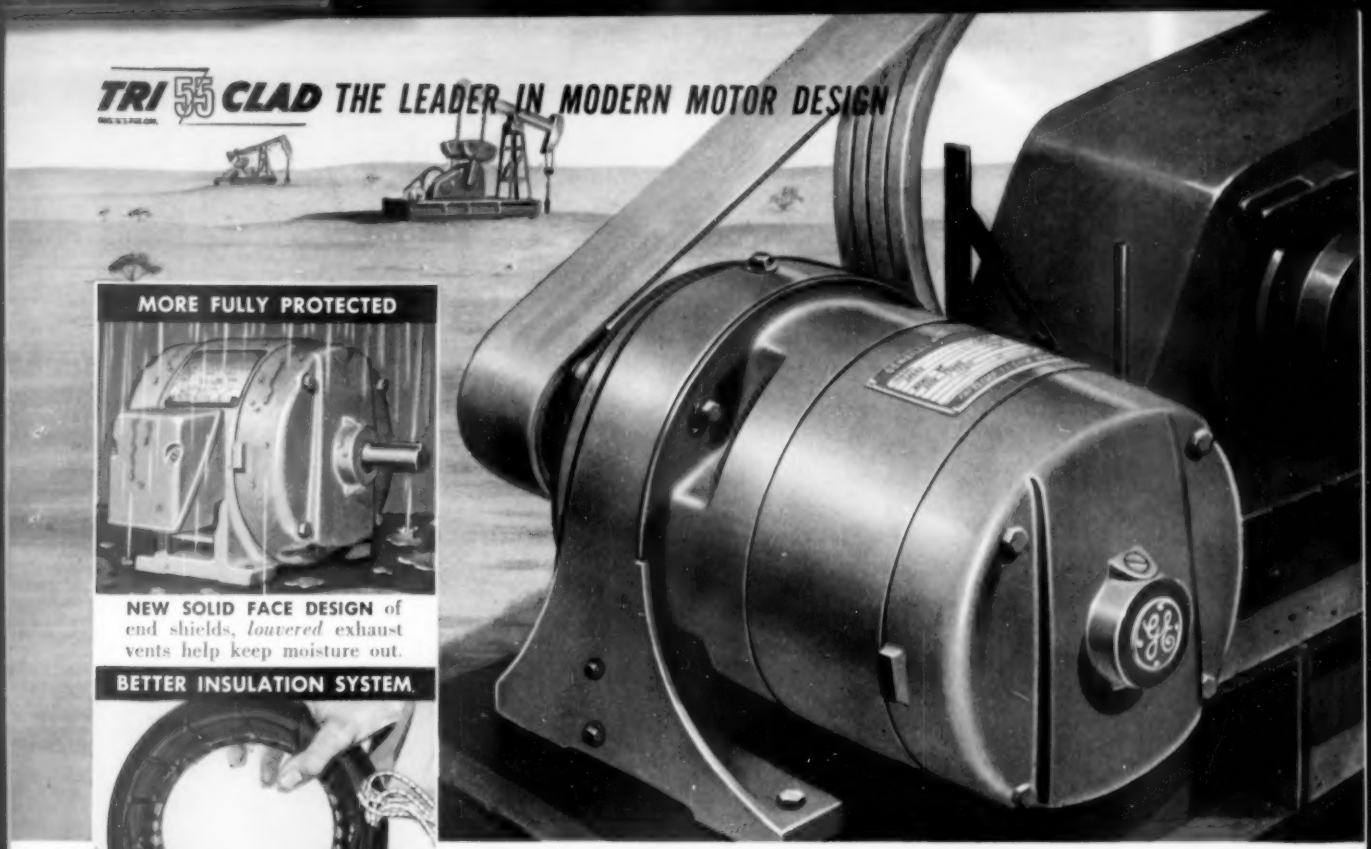
"It sure made me want to go back to drilling"

Yes sir, when they started making hole using that new HYDRA HOOK, my hand was itching to be back on the brake. ★ When I looked at that **streamlined, compact** body, and watched how that "oil cushion" made it **so easy** to spot tool joints without banging up any threads, I **knew** there was the hook that veteran crews would go for in a big way. ★ Who makes it? Why nobody **could** except Web Wilson—the same folks who make those safe, easy operating tongs and elevators and drill pipe slips. ★ Well, yes, I kinda thought you'd want to know more about it, so just call Wm. J. Davis (Old Bill Davis to you) at Oklahoma City 85-258, or drop a line to Box 4884, Zone 9. ★ It will be a real pleasure to see you.

RAYTHEON
• Industrial Electronic Tubes
• Transistors
Send for our
"Electronics REDBOOK"
INTERSTATE
ELECTRONIC SUPPLY CORP.
230 IDA — P. O. BOX 2018
WICHITA, KANS.

For the Safety of Your Derrickmen
GERONIMO
Escape Mechanism
GERONIMO will stand hardest wear and give unfailing protection to refinery and derrick men whose lives are endangered by fire, escaping gases or other hazards.
(Patent Applied For)
Sold Through Your Supply Store
WRITE FOR ILLUSTRATED FOLDER
The CHARLES MACHINE WORKS
PERRY, OKLAHOMA

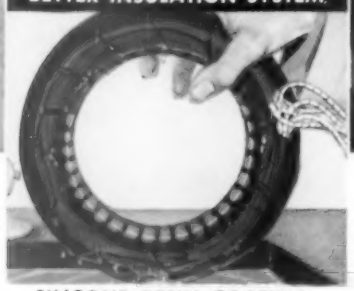
TRI 55 CLAD THE LEADER IN MODERN MOTOR DESIGN



MORE FULLY PROTECTED

NEW SOLID FACE DESIGN of end shields, *louvered* exhaust vents help keep moisture out.

BETTER INSULATION SYSTEM



SILICONE RESIN COATING, Dri-film*, makes insulation shed water—lengthens its life.

NON-WICKING LEADS

PERMA-NUMBERED LEADS won't wick water into the motor—assure quick identification.

LONGER MOTOR LIFE

NEW BEARING SYSTEM means the G-E motor runs longer without relubrication than any other.

Now, important advances in motor protection . . .

New TRI 55 CLAD motor gives you longer motor life . . . outdoors or in!

REG. U.S. PAT. OFF.

Here is a dripproof motor that can be properly applied to outdoor applications like oil well pumping. It's the new G-E Tri/Clad '55' motor with more physical protection . . . more electrical life.

Here are some of the protection features that add to the life of this new motor. End shields and frame are rust-resistant cast iron. Air vents are protected at the base of the end shield—not exposed on the face. Side exhaust vents are *louvered*. To help prevent moisture damage, the insulation system of the new Tri/Clad '55' motor incorporates newest materials like a silicone stator coating and polyester-film for slot and phase insulation.

The new Tri/Clad '55' motor is simple for you to install. Diagonally split conduit box offers ample knuckle room and leads are permanumbered for instant reading. Stainless steel nameplate carries wiring diagram. Lock-in screens for rodent protection are available.

General Electric Tri/Clad '55' motors are now available in many ratings. Complete line of 1 to 30 hp a-c motors will be available soon. For full details contact your G-E Apparatus Sales Office or G-E Motor Supplier today. Write for Tri/Clad '55' bulletins GEA-6013—Dripproof motors, GEA-6012—Enclosed motors, GEA-6027—Gear-motors. General Electric Company, Section 648-11, Schenectady 5, New York.

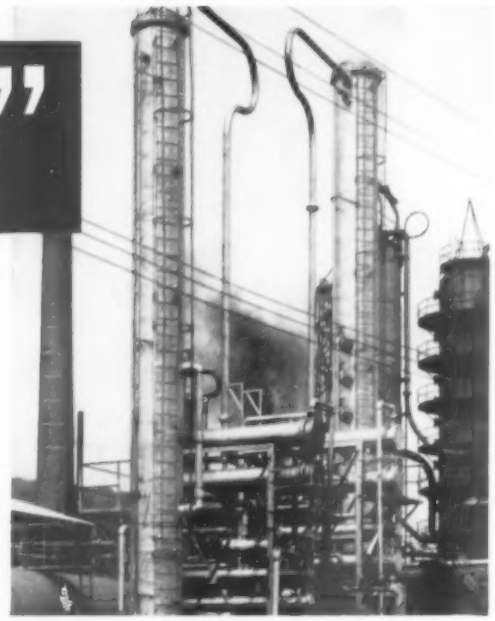
*Reg. trade-mark of General Electric Co.

Progress is our most important product

GENERAL ELECTRIC

"INFERNO"

Built to Assure Extra Safety and Efficiency in Every Steam Hose Service



"INFERNO" Steam Hose, Style D-84, is a Goodall "Standard of Quality" product, outstanding in strength, safety and durability. It will withstand heat, flexing and exposure to weather to an exceptional degree. Despite its strong, powerful construction, it is relatively light in weight and very flexible. It is the *right* hose for every Refinery steam service, including fire smothering.

"INFERNO" is built for pressures up to 200 lbs. and temperatures to 400° F., in sizes from ½" to 2" I.D., and in maximum lengths of 50 feet.

TUBE—The most efficient compound ever developed to resist the charring, hardening, cracking caused by high temperature steam.

CARCASS—Multiple layers of tightly braided high tensile steel wires provide super-strong reinforcement against high pressures. Safety is further insured by special structural feature which, if hose is damaged, causes steam to be diffused, instead of bursting through.

COVER—Special tough, durable compound, highly resistant to heat, weather and abrasive wear. Red-colored for easy identification.

★ ★ ★

STYLE D-162. Same general construction as D-84, but with Static Wire and Neoprene Cover.

Further Details and Prices Promptly, From Our Nearest Branch

GOODALL RUBBER COMPANY

GENERAL OFFICES, MILLS and EXPORT DIVISION, TRENTON, N. J.

Branches: Philadelphia • New York • Boston • Pittsburgh • Indianapolis • Chicago • Detroit • St. Paul
Los Angeles • San Francisco • Seattle • Spokane • Portland • Salt Lake City • Denver
Houston • Goodall Rubber Company of Canada, Ltd., Toronto • Distributors in Other Principal Cities

Est. 1870

Save Time

. . . Use These Handy Time-Saver Cards

Want more information on products advertised in this issue? Or do you want to know more about the items described in the "New Equipment Section"? Or would you like some of the literature here mentioned?

Let us get it for you

Just use the convenient pre-stamped cards on this page. We'll forward your requests promptly.

To The Oil and Gas Journal: Please send me further information, without obligation, on items of New Equipment or Bulletins I have checked (✓) from your issue of August 16, 1954

(1) (2) (3) (4) (5) (6) (7) (8) (9) (10) (11) (12) (13) (14) (15) (16) (17) (18) (19) (20)
(21) (22) (23) (24) (25) (26) (27) (28) (29) (30) (31) (32) (33) (34) (35) (36) (37) (38) (39) (40)

I WOULD LIKE TO RECEIVE FURTHER DETAILS ON PRODUCTS ADVERTISED ON

Page____ By____ Page____ By____
Page____ By____ Page____ By____
Page____ By____ Page____ By____

PLEASE PRINT
COMPANY NAME____
STREET ADDRESS____
CITY____ ZONE NO.____ STATE____
NAME____ TITLE____
This card void after 90 days.

Postage Will be Paid by Addressee

No Postage Stamp Necessary If Mailed in the United States

BUSINESS REPLY CARD
Permit No. 3A, 34.9 P. L. & R., Tulsa, Oklahoma

THE OIL AND GAS JOURNAL
P. O. BOX 1260
TULSA, OKLAHOMA

2

Check here FOR NEW EQUIPMENT *or* LITERATURE

Mark here FOR MORE INFORMATION ON ADVERTISED PRODUCTS

To The Oil and Gas Journal: Please send me further information, without obligation, on items of New Equipment or Bulletins I have checked (✓) from your issue of August 16, 1954

(1) (2) (3) (4) (5) (6) (7) (8) (9) (10) (11) (12) (13) (14) (15) (16) (17) (18) (19) (20)
(21) (22) (23) (24) (25) (26) (27) (28) (29) (30) (31) (32) (33) (34) (35) (36) (37) (38) (39) (40)

I WOULD LIKE TO RECEIVE FURTHER DETAILS ON PRODUCTS ADVERTISED ON

Page____ By____ Page____ By____
Page____ By____ Page____ By____
Page____ By____ Page____ By____

PLEASE PRINT
COMPANY NAME____
STREET ADDRESS____
CITY____ ZONE NO.____ STATE____
NAME____ TITLE____
This card void after 90 days.

Save Time

. . . Use These Handy Time-Saver Cards

Postage Will be Paid by Addressee

No Postage Stamp Necessary If Mailed in the United States

BUSINESS REPLY CARD
Permit No. 3A, 34.9 P. L. & R., Tulsa, Oklahoma

THE OIL AND GAS JOURNAL
P. O. BOX 1260
TULSA, OKLAHOMA

3

To The Oil and Gas Journal: Please send me further information, without obligation, on items of New Equipment or Bulletins I have checked (✓) from your issue of August 16, 1954

(1) (2) (3) (4) (5) (6) (7) (8) (9) (10) (11) (12) (13) (14) (15) (16) (17) (18) (19) (20)
(21) (22) (23) (24) (25) (26) (27) (28) (29) (30) (31) (32) (33) (34) (35) (36) (37) (38) (39) (40)

I WOULD LIKE TO RECEIVE FURTHER DETAILS ON PRODUCTS ADVERTISED ON

Page____ By____ Page____ By____
Page____ By____ Page____ By____
Page____ By____ Page____ By____

PLEASE PRINT
COMPANY NAME____
STREET ADDRESS____
CITY____ ZONE NO.____ STATE____
NAME____ TITLE____
This card void after 90 days.

Postage Will be Paid by Addressee

No Postage Stamp Necessary If Mailed in the United States

BUSINESS REPLY CARD
Permit No. 3A, 34.9 P. L. & R., Tulsa, Oklahoma

THE OIL AND GAS JOURNAL
P. O. BOX 1260
TULSA, OKLAHOMA

1

The cards shown here are supplied for your convenience. Just ✓ ✓ ✓ check the circle with the number of the item in which you are interested, tear off the card, and drop it in the mail.

We do the rest

If you want additional information on any product advertised in this issue, note the page number on the card.

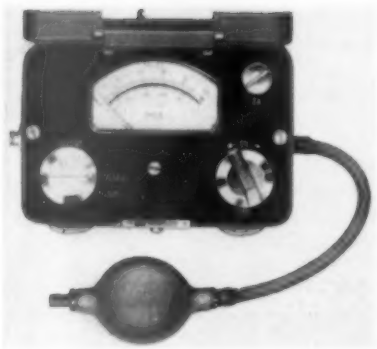
We'll get it for you

(No postage required)

. . . What's New in Equipment?

Use the handy Time-Saver Cards ✔✔✔ to obtain additional information on these items

by Dan B. Miller



Gascope Pinpoints Underground Gas Leaks

A new type of instrument is designed to eliminate many of the problems in locating gas leaks from underground pipelines.

Called the M.S.A. Gascope, the instrument has a dual function. It incorporates two separate principles of combustible-gas detection, and can analyze accurately a complete range of gas concentrations, below and above the explosive limits. With this new instrument, it is possible to pinpoint an underground gas leak without digging up the pipe.

Although the Gascope performs the dual function, the controls remain almost as simple as those on earlier combustible-gas-detection instruments. For measurement of gas concentrations below the lower explosive limit, the instrument utilizes the combustion principle. Gas in the sample is burned on a detector filament which forms part of a balanced electrical circuit. The unbalance, as shown on a meter, is in direct proportion to the concentration of gas present in the sample.

To measure higher concentrations, too rich to burn, the thermal-conductivity principle is employed. This involves use of another filament which also forms part of a balanced electrical circuit. The higher-heat-conduction rate of gas surrounding the filament serves as the index of concentration percentage. Only one switch is used to change from one range to the other when using the instrument. *Mine Safety Appliances Co.*

Check No. 1 On The Time Saver Card

●

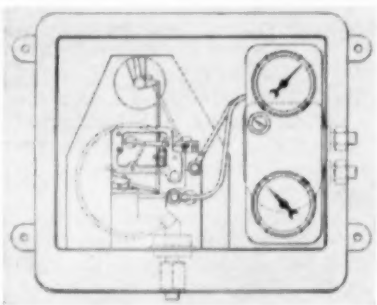
Recessed Button Available On Water Cans, Coolers

Recessed push-button faucets are now available on all sizes of Gotkool water cans and water coolers, except 15 and 20 gal. The convenient, sanitary faucet is easily accessible to workmen with large hands even while wearing gloves.

The recess is pressed into the body of the container, thereby leaving no seam to lose insulation efficiency. Gotkool water cans and water coolers are available with the extended-type faucet. *Gott Manufacturing Co.*

Check No. 2 On The Time Saver Card

●



Pressure Transmitter Can Use Two Types of Elements

A new air-operated pressure transmitter is purely a transmitter; it does not include any recording or indicating mechanisms. Any normal pressure or suction value can be measured and is converted to an air signal, which bears a linear relationship to the measured value. This air signal is fed to a receiving instrument which continuously indicates or records the measured value. Once the initial setting has been carried out the transmitter requires almost no attention.

Two types of measuring element can be fitted in the instrument. For pressure ranges of 0-15 to 0-2,000 psi., a Bourdon tube is employed; while for suction valves, and pressure ranges of 0-3 to 0-14 psi., bellows units are used. The measuring element is connected by means of linkage to a Kent Mark 24 transmitter, which generates the air signal for transmission to the receiving instrument. Both the measuring element and the Mark 24 transmitter are assembled on one plate fitted in the left-hand side of the instrument case. The transmitter operates on the normal air supply pressure of 17 psi. The supply pressure can be set by hand, but is usually set at 17 psi. and locked in that position. *George Kent, Ltd.*

Check No. 3 On The Time Saver Card

●

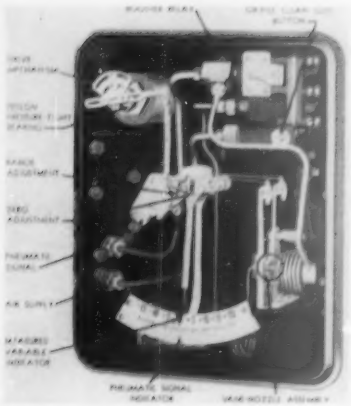
Multi-Port Boiler Gage Is for High-Pressure Use

The Multi-Port gage has been in continuous successful high-pressure operation for more than a year in several leading central-station plants. Principal features are: Very much lower maintenance because of the simplicity of construction and the rapid and easy replacement of the inexpensive small mica, glass, and gasket elements. Greater pressure and thermal stability result from using small, round ports. It does not require long warming-up period. It is readily portable since it weighs about 58 lb. including flanges. It provides for excellent readability since ports stand out as brilliantly colored beacons. Green is water and red is steam. Water level is always where colors meet. *Diamond Power Specialty Corp.*

Check No. 4 On The Time Saver Card

●

What's New... Use the handy Time-Saver Cards



Transmitter Simplifies Pneumatic Control Systems

Pneumatic telemetering and control systems may now be simplified by the use of a new universal transmitting unit. The pneumatic transmitter is available for transmitting measurements of flow, level, pressure, temperature, draft, differential, and vacuum.

The measuring element actuates the transmitter's micro-sensitive vane, nozzle, and booster assembly. Transmitted signals of 3-15 and 3-27 psig. may actuate pneumatic receivers and/or controllers. Both the measured variable and pneumatic signal are indicated on a common scale for easy checking and comparison.

The unit is approximately 8 by 10 by 3½ in. The casing is weather, vibration, and corrosion resistant. Transmitting distances can be 1,000 ft. to receivers, 400 ft. to controllers. Accuracy is within ± ½ per cent of measured range span, and air consumption is less than 0.15 cu. ft. per minute. Capacity is approximately 3 cu. ft. per minute with a drop of 1 psig. from a signal of 15 psig. *Bailey Meter Co.*

Check No. 5 On The Time Saver Card

●

New Markers Locate Survey Points Permanently

New survey markers will locate survey points permanently and eliminate disputes. The use of these nonrusting copper-covered steel markers will perpetuate the results of the surveyor's skill and provide property owners with the protection of permanently marked boundary lines.

Each marker consists of a strong steel core to which a thick copper covering is inseparably molten-welded. This provides strength for easy driving without splintering, bending, or breaking and, at the same time, assures long life.

There are two types. The tinned-end marker has high visibility from the 1½-in. brightly tinned end. It is made in ½ or ⅝-in. diameter, and is ideal for use in uneven or heavy-foliaged ground. The other type has a compression-fit 1½-in.-diameter bronze head, which provides ample space for center-punching the precise point of reference. The bronze-head marker is furnished in ⅝-in. diameter.

In the event these survey markers are buried a few inches under the surface, they can be located easily by using a dip needle. Standard lengths are 3 ft. *Copperweld Steel Co.*

Check No. 6 On The Time Saver Card

●

Liner-Puller Does Job Without Disturbing Rods

A new liner-puller removes the most stubborn liners in minutes and does the job without disturbing the rod.

Since Pioneer's quick-change pistons are removed from the fluid end of the pump, without removing the rod, the new liner-puller is designed as a companion tool to assure a complete time and money-saving operation for drillers using Pioneer pistons.

The new liner-puller is supplied with several different lengths of puller arms to fit in behind liners of all lengths, and is also adaptable to different diameters. The same hydraulic pulling tool that removes Pioneer pistons also attaches to the liner-puller and exerts a steady, even pull of more than 100,000 lb.

All parts of the new tool have been heat-treated and reinforced at points of strain. Complete field testing has proved the new tool to be highly successful and efficient, even under the most difficult conditions. *Pioneer Specialties, Inc.*

Check No. 7 On The Time Saver Card

●

High-Alumina Cracking Catalyst Developed

A new high-alumina fluid cracking catalyst for use in petroleum refining has already been subjected to test performance in a commercial fluid unit at a major oil refinery for more than a year. The results confirmed indications that the catalyst possesses characteristics important to achievement of optimum efficiency in fluid cracking.

The new catalyst has an alumina content of 25 per cent by weight. Favorable results obtained included a greater stability of catalytic activity, a 15 to 25 per cent higher equilibrium activity, and in many cases, improved selectivity of end-product distribution. Stack losses resulting from use of the new catalyst are considerably lower than those ordinarily obtained.

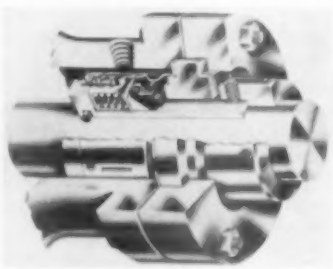
An outstanding advantage in commercial refinery practice is lower catalyst usage for the same cracking performance, or better cracking performance with the same catalyst use. This means lower catalyst cost to the refinery. *American Cyanamid Co.*

Check No. 8 On The Time Saver Card

●

Mechanical Shaft Seal Is Thoroughly Tested

All cargo pumps of an East Coast tanker were equipped with a special adaptation of the John Crane Type 9 seal for service in 11 round-trip voyages between Philadelphia and Texas. On completion of the voyages, inspection of all pumps showed that there had been no leakage whatsoever.



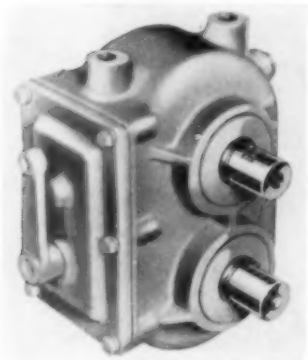
The Type 9 seal is mounted on a sleeve with an outside clamping ring, as illustrated. This permits quick installation or removal in practically all modern split-case pumps, in that it is not necessary to unbolt the top of the horizontal split shell. Thus, in the event of seal failure, the old seal can be

removed and replaced with a new seal in a short time.

The seal can be used to handle practically all corrosive liquids at temperatures to 500°F. Flexible sealing members are made of chemically inert Teflon. Springs and metal parts can be furnished in the metallurgical specification best suited to the service. Sizes are available to specification. *Crane Packing Co.*

Check No. 9 On The Time Saver Card

●



Bearing Hanger Increases Versatility of Takeoffs

A two-speed bearing hanger designed to increase the versatility of power takeoffs for truck-mounted special equipment adds high-speed reverse rotation to regular power-takeoff drives. It is especially important in winch operation, since long lengths of cable can be paid out fast and efficiently at higher speed than is possible with the reverse speed of regular power takeoffs.

A power takeoff with one speed forward, plus the bearing hanger, provides two-speed reversed-drive rotation; while a takeoff with two speeds forward, plus the bearing hanger, provides four-speed reversed-drive rotation.

One of the biggest advantages of the bearing hanger is that it provides multiple-reverse power-takeoff operation on truck chassis where mounting interference prohibits the installation of heavy, bulky two-speed-forward and two-speed-reverse power takeoffs.

Mounting flexibility of the bearing hanger allows it to be placed at the most convenient spot for easy installation. It can be mounted in a horizontal or vertical position, and its drive shafts can face to the front or rear of chassis, as the application requires. Either of the two drive shafts can be used as the drive input shaft.

If special equipment is mounted on a truck chassis as an afterthought, or changed from one truck to another, the bearing hanger permits changing the rotation of the truck power-takeoff drive to match the direction of rotation of the special equipment input shaft. *Gar Wood Industries.*

Check No. 10 On The Time Saver Card

●

Tenite-Butyrate Pipe Is Made for Crude Oil Use

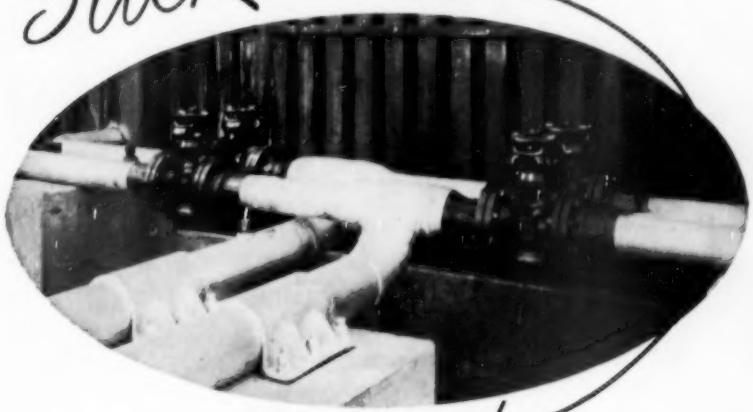
Corrosion-resistant Walpipe is the answer to a major petroleum-industry problem because it successfully resists corrosion caused by sour crude oil.

Walpipe is the name of tenite-butyrate pipe available in diameters comparable to those of steel for the purpose of conducting crude oil and salt water. Not only is it corrosion resistant, but it has the distinct advantage of being lightweight, about one-twelfth that of cement-lined steel pipe commonly used.

Walpipe is continuously extruded and can be produced in any length, but is usually cut in 20-ft. lengths. The pipe may be cut on the job to shorter lengths by means of a handsaw. It is joined together by means of a slip-sleeve coupling. A solvent cement joins

HAMER
PLUG VALVES
can't stick!

Model FS15P illustrated here has Pressure Seal packings which require neither tightening nor adjustment.



HERE'S WHY:

The plug adjusting nut, an exclusive feature on all HAMER PLUG VALVES permits the plug to be lifted slightly from its seat, making it easy to open or close the valve. A simple turn lowers the plug back into its seat and holds it there in perfect alignment. No matter what the service conditions, or lapse of time between operations, this outstanding HAMER feature assures POSITIVE E-Z turn control of the plug at all times.

HAMER *Line Blind Valves*

Built for strength and durability, HAMER LINE BLIND VALVES are the modern means of blinding pipe lines quickly and effectively. A one-man, one-minute operation. Cuts costs, and speeds up operations.

HAMER

Send for FREE Catalog

VALVES, INC.

2919 Gardenia Avenue
Long Beach 6, California
Representatives throughout the United States

the pipe together permanently. Flange unions and threaded male and female adapters are used for connecting to standard threaded equipment and existing steel pipelines. *Waljohn Plastics, Inc.*

Check No. 11 On The Time Saver Card

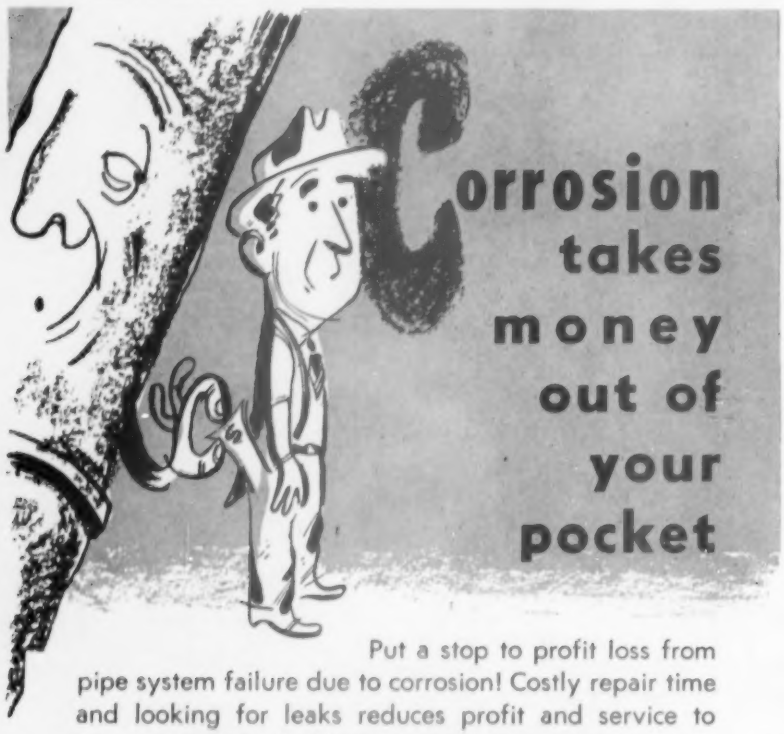
Field Office Trailer Unit Offers More Floor Space

Major change in the Model FO35-D, a 35-ft. field-office trailer with tandem running gear, is the newly designed chassis which completely eliminates wheel-well boxes from the interior, thus adding more working floor space to the same size trailer. The floor has been more rigidly constructed on 2 by 8's with greater heat duct capacity to the floor register.

The chassis of this model is electrically welded with 6-in. structural-steel channel mains and cross members. Four 48-in. fluorescent lights and six double outlets are located for convenience. Kerosine heating stove, with blower of 27,000 B.t.u. capacity is installed with hot-air duct to provide heat to private office in rear.

Standard furniture installed includes a superintendent's desk at each end with two knee holes and six drawers, full-width overhead cabinets at each end, a draftsman's table, enclosed closet, and blue-print rack. Front and rear of trailer are effectively separated by a wall partition fitted with sliding door. *International Trailer Co.*

Check No. 12 On The Time Saver Card



Put a stop to profit loss from pipe system failure due to corrosion! Costly repair time and looking for leaks reduces profit and service to your customers. **An-Spec magnesium anodes** can prolong the life of your underground metal pipe systems by years. The most modern way to combat profit stealing corrosion . . . is by installing **An-Spec magnesium anodes** . . . your quality anodes . . .

PIPE LINE ANODE CORPORATION

25th WEST AVENUE AND SAND SPRINGS ROAD
P. O. BOX 996 ● TULSA, OKLAHOMA

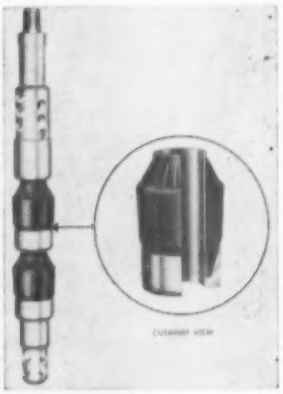
Pipeline Supply Company
2230 Magnolia Street
Birmingham Alabama

Cross Pipeline Equipment Co.
858 Wilson Avenue
Newark, New Jersey

Cross-Curran, Ltd.
11102 Jasper Avenue
Edmonton, Alberta

Pipeline Supply Company
912 West 11th
Houston, Texas

ANODE SPECIALISTS
AN·SPEC



Metal Cages Eliminated In New Tubing Swab

A new type of tubing swab combines the performance advantages of the cup type of rubber with the fact that there is no metal exposed to damage the surface of the tubing or to wear out and "stick" the swab.

As can be seen in the cutaway view, hollow pockets are molded into the rubber swab cups, nd these pockets fill with fluid as the swab is raised, flexing the swab lip against the inside surface of the tubing for a tight seal.

To reinforce the swab lip and hold it concentric, rubber ribs are molded integrally with the swab body and cup, thus supporting the load and holding the swab lip in proper formation. These integral rubber ribs eliminate the need for metal cages to support the cups.

One basic type handles light, medium, and heavy loads. This eliminates need for changing the cups in order to handle varying types of loads. *The Drovil Co.*

Check No. 13 On The Time Saver Card

All-Bronze Chain Wrench Provides Safety Factor

Four sizes of an all-bronze safety-chain pipe wrench have recently been announced. As an economy feature, the beryllium-copper jaw inserts are reversible and interchangeable to give longer improved service. *Ampco Metal, Inc.*

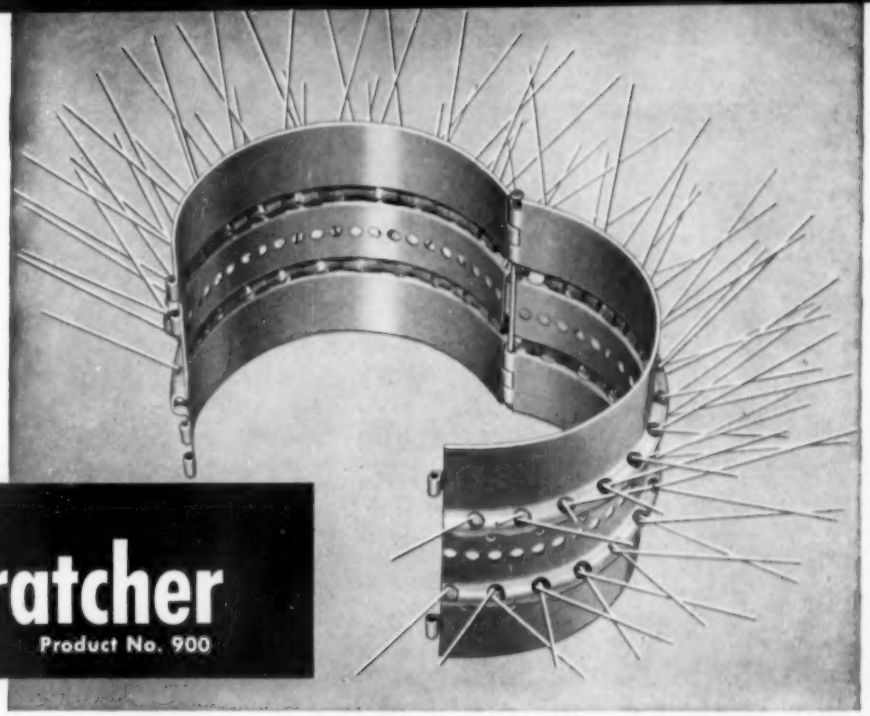
Check No. 14 On The Time Saver Card

THE NEW

BAKER

Wall Scratcher

Product No. 900



for controlled removal of mud cake to obtain a better primary cement job

One of the most important operations in conditioning the wall of the hole for a primary cement job is the removal of mud cake throughout the intervals to be cemented. The Baker Wall Scratcher was designed specifically to perform that operation.

Hinged for easy installation, the Baker Wall Scratcher is equipped with two full rows of sturdy, spring-loaded scratcher wires that give complete 360° scratching coverage. Each pair of wires is crossed for greater strength in cutting the wall cake into small particles.

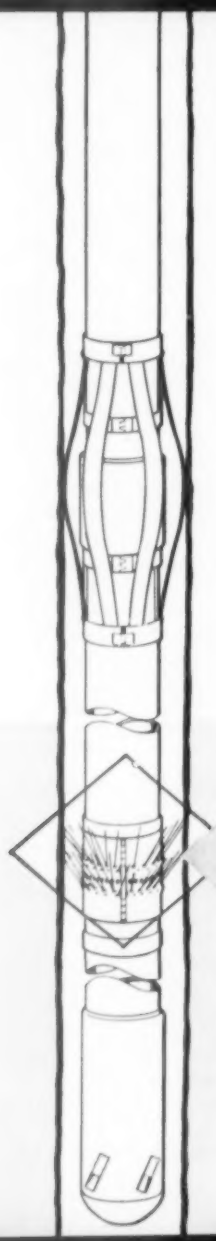
The scratcher wires are pitched upward so that the scratcher can, first of all, be run to scratching depth without causing any significant disturbance of the mud cake. This feature is even more important during the actual hole-conditioning operation, because the up-pitched scratcher wires dig more firmly into the wall cake and are forced into a position of maximum reach and scratching efficiency whenever the casing is raised more than the distance between Stop Rings.

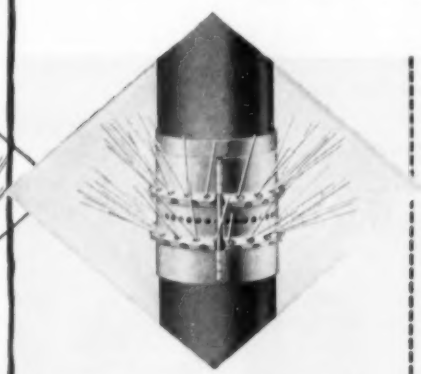
QUICK FACTS *about Baker Wall Scratchers*

1. Spring-loaded scratcher wires are pitched upward to dig firmly into mud cake with maximum reach and scratching efficiency on the upstroke during scratching operation.
2. During down-hole travel, up-pitched scratcher wires ride easily along surface of well bore and minimize scratching action.
3. Mud cake remains undisturbed until casing is raised more than distance between Stop Rings.
4. Scratchers reach scratching depth in good condition, with scratching efficiency unimpaired by excessive distortion of wires and springs.
5. Two rows of sturdy scratcher wires, crossed in pairs, assure full 360° scratching of more surface at each stroke; cut wall cake into smaller particles.
6. Scratcher wires are available in two lengths to meet the specific needs of slim-hole or regular programs.
7. Hinged for rapid, easy installation.

BAKER OIL TOOLS, INC.

HOUSTON • LOS ANGELES • NEW YORK

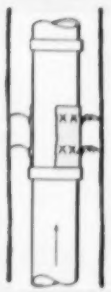




Here is how controlled scratching works →

During down-hole travel, the up-pitched scratcher wires ride easily along the surface of the well bore so that no significant disturbance of the mud cake will result.

When the casing is lifted up out of the slips during the running-in operation, no scratching action occurs. Scratcher remains stationary until contacted by Stop Rings.



On each upstroke during the actual scratching operation, the crossed pairs of up-pitched scratcher wires dig firmly into the mud cake with maximum reach and scratching efficiency.

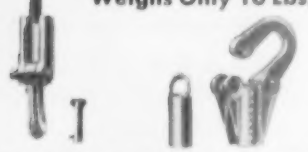
Telephones:
HOUSTON
UN-1253
MA-5557 MI-9-0747 OX-2-5135
MO-5-6809 TW-1397 OL-1589

TRADE MARK REG. U. S. PAT. OFF.
TIME TESTED
MACCO
GAS LIFT

ALICE
4-4993
4-5787
MIDLAND
3-3936
VICTORIA
1058
3848
BEAUMONT
5-1958
2-7637
ZF-78424
LAFAYETTE, LA.
8-9851
5-4479
4-2477

Ratigan

60,000 POUNDS CAPACITY
Yet Only 8" Long
Weighs Only 16 Lbs.



No. 142 Stringing-up Link

Composed of only two parts, the body and the babbit socket, the Ratigan #142 Stringing-Up Link is a safe, fast-acting link. It eliminates looping and bending of the cable, and tightening of the bull-dog clamps.

An automatic safety pin prevents the socket from escaping the body until the pin is removed and the bail opened.

SOLD BY LEADING SUPPLY STORES EVERYWHERE

J. P. RATIGAN, Inc.
1213 Santa Fe Ave., Los Angeles 21
Export: National Supply Co., Inc., Export Div.
600 Fifth Ave., New York 20, N.Y.

They're NEW

- Bulletins
- Catalogs
- Brochures

for your copy, check ✓ ✓ the Time-Saver Cards.

Synthetic-Resin Coatings. A new eight-page bulletin on synthetic-resin coatings, describing vinyl, phenolic, saran, polyethylene, epon, neoprene, plastisol, and silicone coatings, illustrates coating applications to storage tanks in the shipping, petroleum, and chemical industries. A covered railroad siding for lining tank cars and various types of transportation equipment is also featured *Metalweld, Inc.*

Check No. 15 On The Time Saver Card

●

Power Points Digest. How Onan electric plants are used as emergency standby units for contractors' portable power needs, as magnet chargers for cranes and trucks, and for primary power for a display coach is told in Volume 10, No. 3. Many interesting installations are described in the 2-color, pocket-sized, 16-page booklet. When commercial power goes off at any of the unattended microwave repeater stations operated by Michigan-Wisconsin Pipeline Co., standby plants automatically take over. *D. W. Onan & Sons, Inc.*

Check No. 16 On The Time Saver Card

●

Pneumatic Controller Catalog. Stack-type pneumatic controllers for process variables are illustrated with cutaway construction photos, schematic diagrams, and dimension drawings in the 12-page Catalog 53-10. Specifications, controller-response actions, and a controller selection guide cover complete details of case-mounted, field-mounted, and valve-mounted control instruments. *Fischer & Porter Co.*

Check No. 17 On The Time Saver Card

●

Portable X-Ray Radiography Unit. A new four-page folder titled Norelco MG 160 describes a new portable self-contained industrial X-ray radiographic unit. Illustrated with a number of photos, the new literature explains the X-ray head, the control, and other features of the MG 160 unit, which is easily carried in the trunk of an automobile. Application data, useful in examinations of stressed components, welds, frames, castings, steel structures, hidden assemblies, ceramics, and plastics, is given. *North American Phillips Co., Inc.*

Check No. 18 On The Time Saver Card

●

Taper-Lock Sprocket and Dodge Roller Chain. Information contained in this compact four-page Bulletin A-632 covers latest technical data and prices on all items in the newly extended Taper-Lock line which includes sprockets and chain for sizes ranging from 40 through 160. The pitch range is from ½ through 2 in. The first page is devoted to an illustrated explanation of the simplicity and ease with which Taper-Lock sprockets can be installed and removed. Pages 2 and 3 contain tabular data relating to Taper-Lock sprockets in the complete size range, cross-section drawings, dimensions, number of teeth, sprocket numbers, bushing numbers, weights, bores, keyseats, and list prices. *Dodge Manufacturing Co.*

Check No. 19 On The Time Saver Card

●

Pneumatic-Operated Control. A new system of instrumentation for the measurement and/or control of liquids is described in a new eight-page Bulletin 5421. The bulletin illustrates the five basic principles used, its uses and applications in water and waste treatment plans, and the ease with which it can accomplish all the various types of process measurement and control. *General Filter Co.*

Check No. 20 On The Time Saver Card

●

Garlock Lattice Braid Packing. A completely new folder, Bulletin A-131, describing Lattice Braid rod and shaft packings, points out the construction features and describes available materials, sizes, and forms. It also contains illustrative service reports from users in various industries. *The Garlock Packing Co.*

Check No. 21 On The Time Saver Card

●

Golden-Anderson Cushioned Flowtrol valve is fully described in new technical Bulletin W8-A. The Flowtrol valve was designed to replace troublesome globe, angle, plug, or gate valves that require frequent manual opening and closing at considerable waste of time and effort. One man can easily operate the Flowtrol to either the fully open or tightly closed position, although the valve size is 2 or 36 in., or the pressure in the

line is 15 or 400 psi. *Golden-Anderson Valve Specialty Co.*

Check No. 22 On The Time Saver Card

●

Bucyrus-Erie 60-L Spudder. A 24-page Bulletin 60-L-1 describes the 60-L spudder. The illustrated, easy-to-read booklet offers a complete description of the machine's features along with a general specifications list. The 60-L, which replaced Model 24-L, is designed to handle top-to-bottom drilling to 1,500 ft. in depth and tailing-in and well-servicing to 2,000-ft. depths. The rig swings tool strings up to 2,750 lb. *Bucyrus-Erie Co.*

Check No. 23 On The Time Saver Card

●

Shorty Blocks. A new eight-page, three-color bulletin featuring a complete line of Shorty blocks, is fully illustrated with photographs, detailed drawings, and specifications. One of the features of the Shorty block line described is the unitizing of the hook assembly with the traveling block which reduces the overall block and hook lengths in some cases by as much as 9 ft. A new development is the availability of a full size range of Shorty blocks with a conventional clevis. These are engineered to accommodate any type hook initially, and allow for easy conversion, when desired, to the Shorty block unitized with Shorty hook assembly. *Ideco, one of the Dresser Industries.*

Check No. 24 On The Time Saver Card

●

Cox 90 Series Flow Meter. A four-page customer bulletin and supplementary literature cover the design features, maximum flow capacities, maintenance requirements, and mounting drawings of the new Cox Type 12 multiple-stage flow meter. The Bulletin No. 1052 is intended primarily for the benefit of men in the chemical and petroleum industries who require a more compact, low-cost flow meter offering high capacity and accuracy. *Commercial Research Laboratories, Inc.*

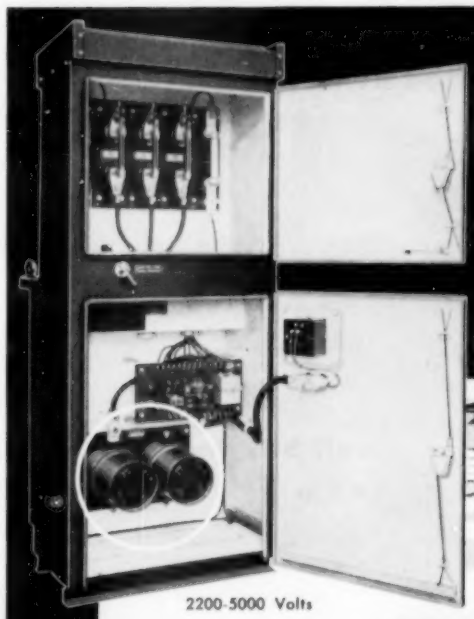
Check No. 25 On The Time Saver Card

●

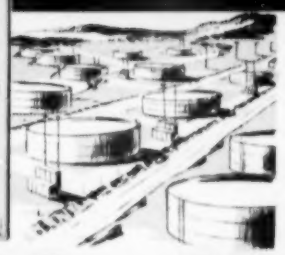
The Econ-O-Max, for economical application of low-temperature separation to small gas-condensate wells, is presented in Catalog 33-O1A. The bulletin includes a color flow diagram, installation photos, case histories, and charts and graphs to assist in solutions to recovery problems. *Black, Sivalls & Bryson, Inc.*

Check No. 26 On The Time Saver Card

●



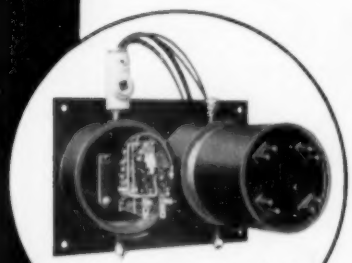
OIL MEN Specify:



2200-5000 Volts

EC&M

50,000 KVA
Interrupting Capacity
MOTOR STARTERS



Enclosing covers on Overload Relays screwed on . . . give quick access.

OUTSTANDING ADVANTAGES

1. Reduced floor space
2. Low-cost Div. 2 design
3. 50,000 KVA interrupting capacity
4. Combination starter with Disconnect Switches
5. Corrosion resistant, weather-proof construction
6. Copper tungsten contacts for positive operation
7. Simple 3-wire TIME-DELAY UVP push button circuit
8. THERMAL-MAGNETIC Overload Relays give accurate motor protection . . . trip instantly on faults
9. All internal wiring complete

1914

Petroleum engineers specify these starters for Division 2 semi-hazardous locations because they assure substantial savings in installation and operation.

Construction advantages include: drip-proof roof . . . tank-cover and front cubicle doors . . . oil switch which opens 220-volt control transformer before upper door can be opened to operate main line disconnects . . . hermetically sealed control circuit contacts . . . main contactor with alloy contacts oil-immersed in rear tank. On voltage dips, push button circuit maintained up to 2 seconds by simple 3-wire circuit, permits opening of "stop" circuit without delay.

EC&M 2200-5000 volt Starters are also available in Division 1 style for Class 1, Group D Hazardous Locations. For interrupting capacities above 50,000 KVA, EC&M VALIMITOR (volt-ampere-limitor) Starters are furnished in both Division 1 and Division 2 construction.

Write for 16-page Booklet 1062 for complete details.

THE ELECTRIC CONTROLLER & MFG. COMPANY

2698 EAST 79TH STREET • CLEVELAND 4, OHIO

an old principle
—an extraordinary result

ball bearings rolling on a FLAT surface

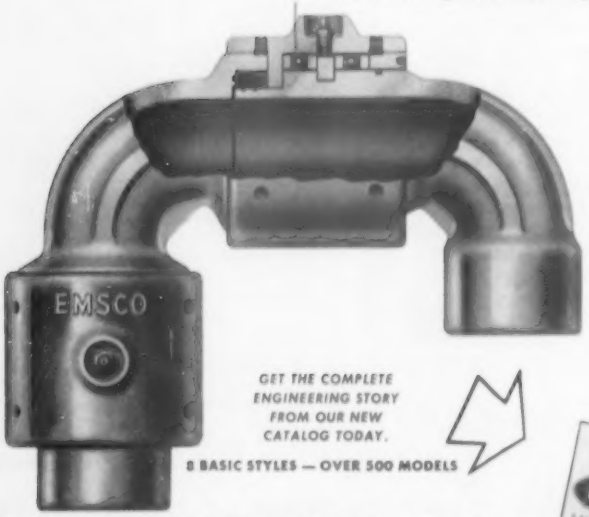
- *offer less friction*
- *are easy turning*
- *wear longer*

EMSCO
BALL BEARING SWIVEL FITTINGS

It's an old principle, a ball rolling on a flat surface – making a single point of contact, and when applied to a ball bearing swivel fitting you get an extraordinary result – free and easy rotation even under extreme pressures. Compare EMSCO on this point!

Should you take the EMSCO fitting apart – and it's easy to do because it breaks like a union, you'll note a unique packing and ball race design which permits easy adjustment for wear. No expensive return of fittings to the factory for service. Note also how the large fluid passageways and smooth, easy contour of bends reduces turbulence and increases flow.

You'll find an EMSCO ball bearing swivel fitting for almost any application.



GET THE COMPLETE ENGINEERING STORY FROM OUR NEW CATALOG TODAY.

8 BASIC STYLES — OVER 500 MODELS

EMSCO MANUFACTURING COMPANY
BOX 2098, TERMINAL ANNEX
Houston, Texas • LOS ANGELES 54, CALIFORNIA • Garland, Texas
Representatives in principal cities

New Model 240. The new Model 240 trencher for pipelines and miscellaneous construction projects is described in a four-page, two-color Bulletin S-119. A full-crawler-mounted wheel-type trencher, the 240 digs up to 36 in. wide and down to 6 ft. 3 in. deep. Although ruggedly constructed, the new model is easily portable and does not require special permits for job-to-job hauling. Copy is keyed to a side-view photo of the 240 so as to clearly indicate the locations of the features described. The bulletin also contains a table of the 48 available digging wheel and crawler speed combinations providing over 33 digging speeds, and a table of optional digging widths. *The Cleveland Trencher Co.*

Check No. 27 On The Time Saver Card

Complete Corrosion-Proofing Service for Industry. In concise form, Catalog G-201 presents comprehensive information on a complete line of corrosion-proof linings, bricks, bonding cements, protective coatings, and mastic floors. Manufactured from a variety of base formulations, these materials have different chemical and physical properties that will meet the requirements of a wide range of industrial applications. *Ceilcote Co.*

Check No. 28 On The Time Saver Card

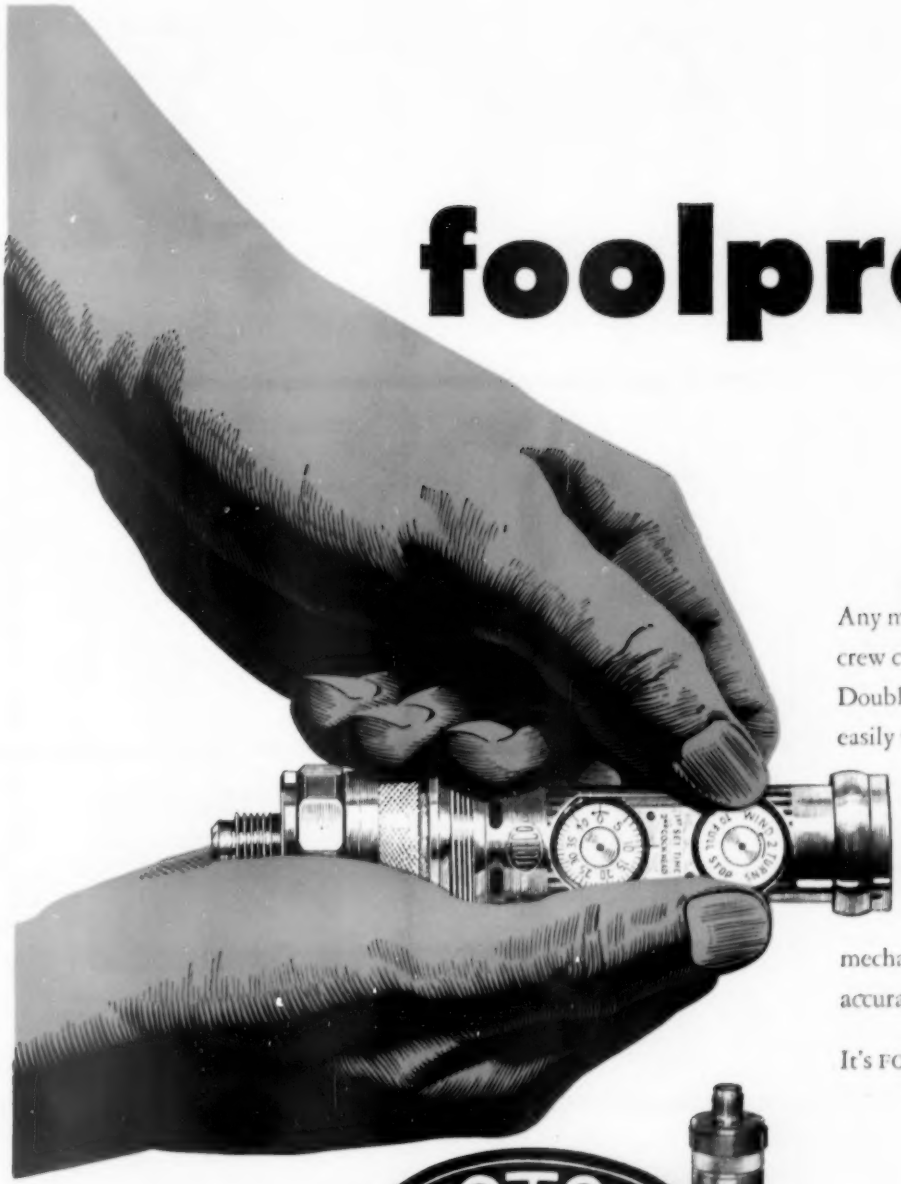
Modern Design Two-Pole Motors. Bulletin O5R8123 incorporates a reprint of the article "Auxiliary Drive Motor Keeps Pace With Modern Power" by C. D. Lawton, of the firm's motor and generator section. Diagrams in the eight-page bulletin include a sectioned view of a typical large, two-pole, squirrel-case, induction motor, and another showing how the machine is spirally ventilated. Redesigned to meet requirements of today's high-speed drives, these induction motors are ideal for boiler-feed pumps, pipeline pumps, centrifugal blowers, descaling pumps, and similar applications. *Allis-Chalmers Manufacturing Co.*

Check No. 29 On The Time Saver Card

One-Package Export Service. A four-page bulletin describes the planning, packing, shipping, manufacturing, testing, and assembly facilities of a world-wide source of petroleum equipment and supplies. Particularly stressed in the booklet is the service organization for follow through to fields located anywhere. *Ideco, One of the Dresser Industries.*

Check No. 30 On The Time Saver Card

foolproof



Any member of the drilling crew can operate a Totco Double Recorder quickly and easily with *accurate* results.

There's no involved procedure—no batteries, chemicals or ink pots . . . just a simple, mechanical instrument that gives accurate readings every time.

It's FOOLPROOF.

BE SURE YOU KNOW, USE TOTCO

double recorder

Technical Oil Tool Corporation
1057 N. La Brea Avenue,
Los Angeles 38, Calif.

EXCLUSIVE DISTRIBUTORS:

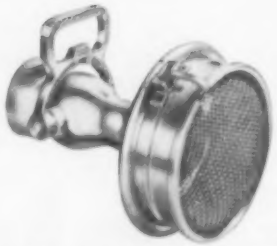
California—The Republic Supply Co. of California
Domestic—The Continental Supply Company
Canada—Oil Well Supply Division United States Steel Company
Export—Lucey Export Corporation, New York City

New Ways to Fight Fire

Rockwood offers you two big advantages. One is long, practical experience in manufacture and in the field. The other is constant research that results in **new** methods and **new** devices to fight fire. These pages show you a few of the many products developed by Rockwood that have a vital part in fire protection programs throughout this country.

For further details on these products, and many, many others, write for your free copy of the Rockwood Catalog, "Fire Fighting Products." ROCKWOOD SPRINKLER COMPANY, 368 HARLOW STREET, WORCESTER 5, MASS. Distributors in all principal cities.

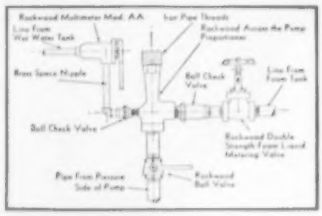
ROCKWOOD



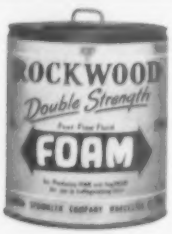
Type FFF FogFOAM Nozzle. Discharges FogFOAM, Solid FOAM stream, and High Velocity WaterFOG.

Type SG-48 WaterFOG Nozzle. Easy to handle. Discharges high or low velocity WaterFOG or straight water stream.

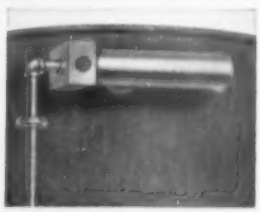
Foam Eductor. Introduces FOAM liquid into hose lines. Used with Type FFF FogFOAM Nozzles.



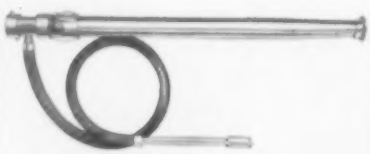
Proportioning Systems. Used when pressure is maintained by pump. Custom-engineered systems also available.



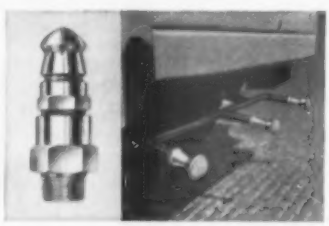
Double Strength Foam Liquid for fire hose line Nozzles and permanently piped FogFOAM and FOAM installations.



Rockwood Foam Maker and Chamber. Used for fighting flammable liquid tank fires.

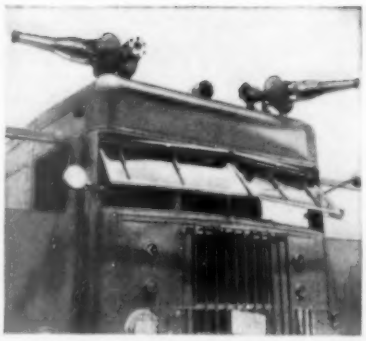


Standard Straight Foam Play Pipe and FOAM pick-up tube. Discharges solid FOAM stream.

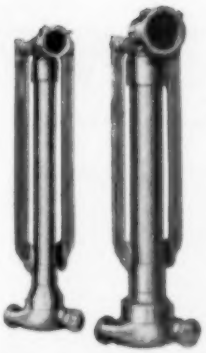


Under Truck and Ground Sweep Nozzles. Used to protect front of fire trucks and parts under trucks.

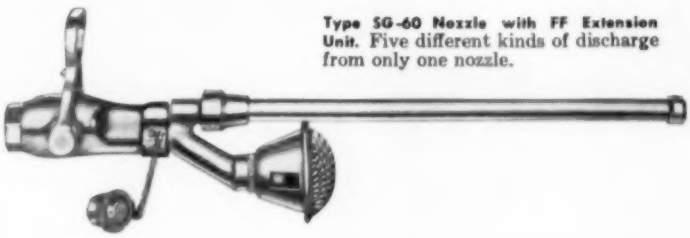
ROCKWOOD
SPRINKLER COMPANY



Hydraulically or Manually Controlled Type FFF FogFOAM Turret Nozzle for airport crash fire fighting trucks and special fire fighting trucks for oil refineries, chemical and industrial plants and municipalities.

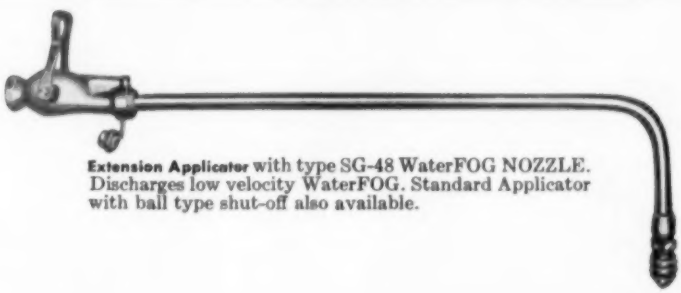


Lightweight Rotating Cellar and Attic Pipe. Fights fires in cellars, attics, under piers, bridges, etc. Also available in a short unit with swivel but without extension barrel.



Type SG-60 Nozzle with FF Extension Unit. Five different kinds of discharge from only one nozzle.

Rockwood Ball Type Shut-Off. Gives operator complete control of water flow from nozzles.

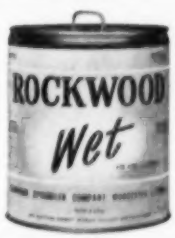


Extension Applicator with type SG-48 WaterFOG NOZZLE. Discharges low velocity WaterFOG. Standard Applicator with ball type shut-off also available.

High Capacity WaterFOG Nozzle. Quickly controls and extinguishes large fires in buildings and flammable liquids.

Type N22 WaterFOG Nozzle. Discharges high velocity WaterFOG. For general use around live electrical equipment.

Rockwood Type N-23 WaterFOG Nozzle with swivel handles. Discharges high velocity WaterFOG with higher discharge, greater range than type N-22 Nozzle.



Rockwood Wet wetting agent. Increases fire extinguishing action of water making a little water go a long way.

Engineers Water . . . to cut fire losses

EQUIPMENT MEN . . . in the News

Officers of the new Kobe, Inc., shown here are: C. J. Coberly, president; James C. Coberly, Jr., vice president and general manager; and Harry C. Gunetti, vice president for manufacturing.

Kobe Founders Buy Kobe, Inc., from Dresser

Kobe, Inc., newly organized by the founders of the original company of the same name has purchased the business and facilities of Kobe Division of Dresser Equipment Co. General office and plant of the new company will remain in Huntington Park, Calif.

Announcement was made by the president of the new company, C. J. Coberly, long prominent in the oil industry as inventor of the hydraulic oil-well pump, the Kobe free pump, and other engineering innovations.

Other officers of the company include C. James Coberly, Jr., vice president and general manager, and Harry C. Gunetti, vice president for manufacturing. James Coberly was previously president of Surface Alloys, Inc. Gunetti has been vice president of Joshua Hendy, and most recently the manufacturing vice president of Locomotive Finished Materials Co.

Lutz Made General Sales Manager of All-State

K. V. LUTZ

Kenneth V. Lutz has been appointed general sales manager of All-State Welding Alloys Co., Inc. Announcement of his promotion was made by Thomas D. Nast, president.

Lutz will direct sales and service to users and distributors of All-State alloys and fluxes, and also the establishment of additional facilities when needed. All-State regional managers will have his guidance and counsel in solving field problems.

Of the 6 years Lutz has worked with All-State, the major portion was as regional manager for 11 western states and Hawaii.

John Marshall Makes Tour of Oil Fields

John B. Marshall, specialty salesman covering the Mid-Continent, Intermountain, and California areas of Gustin-Bacon Manufacturing Co., Kansas City, has just returned from a 60-day tour of oil fields throughout the United States.

Marshall has a wide experience in the oil industry, having worked for W. C. Norris, Inc., and Walter O'Bannon Co. He will continue to make his headquarters at the Tulsa office.

Fort Worth Steel Makes Giant Sheave

Pictured is an 84-in. pitch diameter, 20-D-groove sheave recently manufactured by Fort Worth Steel & Machinery Co. for Arrow Drilling Co. It replaced a 72-in. sheave, thereby permitting slowing down the mud pumps to ease the load. The order was placed through John C. Burge Co., Oklahoma City, and C. G. Unlaub Co., Tulsa. The casing weighs over 6,000 lb. and was made in Fort Worth Steel's Dallas foundry, with the machine work then being handled in the Fort Worth plant. Moody Jackson, Fort Worth Steel V-drive sales manager, is shown with the sheave.

Irrgang Elected President Of Lincoln Electric Co.

W. IRRGANG

J. F. LINCOLN

At a July meeting, the board of directors of The Lincoln Electric Co., Cleveland, Ohio, elected William Irrgang president and general manager of the company. James F. Lincoln, elected chairman of the board, will remain active in the direction of company policies.

John C. Lincoln, founder of the company, was elected honorary chairman of the board and treasurer. Other officers elected were John S. Roscoe, executive vice president; A. F. Davis, vice president and secretary; and George Landis, vice president.

Irrgang becomes the third president in the 59-year history of the manufacturer of arc welding equipment. He has been executive vice president since October 1951. He joined Lincoln in 1929, and has been engaged in various phases of plant operation, engineering, and management.

Jones Heads U. S. Operations For Exploration Seismic Inc.

M. P. JONES

Maynard P. Jones has returned to an active status in domestic operations at Exploration Seismic Inc. Jones recently returned from Caracas, Venezuela, where he was resident vice president. Jones' new position will be vice president in charge of domestic operations for the firm. In this capacity he will supervise the firm's operations seismic crews and will engage in augmenting the research and interpretative staff of Exploration Seismic.

Jones has been engaged in technical services to the oil industry since 1934. He served in technical and supervisory capacities with Geophysical Service,

"THE BRAND OF PROGRESS"

By Heat Exchanger Specialists

▲ SYNOPSIS OF AD #6: The many complexities of the modern processing industries have greatly elevated the importance of the metallurgical engineers and welding technicians of Western Supply Company. These men, working as a team, have guided Western through years of delicate fabrication in the AISI Stainless Steels in the 300 series . . . High Chrome Irons . . . the Refiner's Alloys, the low chrome Moly Steels . . . Monel . . . Copper . . . Copper Silicon . . . . . Nickel . . . Aluminum.

When fouling of heat exchanger tubes and shells is a tough problem . . . you can rely on the special metal design and fabrication experience of Western Supply Company.

seventh in a new series of advertisements

Drilling a hole should be a simple operation. Thousands of work-shop hobbists do it every day. But in the Western Supply Company plant, drilling a simple hole becomes a science.

These holes, in the stationary and floating tube-sheets must hold the heat exchanger tubes in a vapor or fluid-tight joint. Many tube-sheets have hundreds of such tube holes. A leak in any one, by permitting the mixing of shell-side and tube-side fluids, could prove costly, dangerous or both. To prevent this, TEMA (Tubular Exchanger Manufacturers Association) tube-hole tolerance for normal fit is plus/minus .002 of the specified tube hole diameter. In addition to tube hole diameter, the location of holes and accuracy of ligament between holes as well as tube hole drift are equally important factors.

To assure meeting TEMA specifications, Western's drilling technique is as follows:

1. After tube sheet machining, tube holes are scribed by the layout department.
2. Fully scribed, the hole locations are then carefully center punched.
3. With the completely layed-out tube sheet on the drill press, drill position is exactly established with a dead center tool and the radial drill locked into position.
4. The hole is drilled .015 under final specification.
5. The tube hole is reamed to size, normally .010 plus/minus .002 over nominal tube diameter.
6. All tube holes for Class R equipment have two 1/8" wide by 1/64" deep serrations.
7. All tube holes are chamfered 45° on both sides of tube sheet.
8. Tube sheets are chemically cleaned to de-grease prior to assembly.

That's "The Hole Story" behind every tube hole drilled at Western Supply Company for Western Heat Exchangers.

WESTERN
HEAT EXCHANGERS

WESTERN SUPPLY CO.

P. O. BOX 1888 • TULSA, OKLAHOMA

Inc., Dallas, and was also associated with Melvin M. Garrett in organizing Garrett Exploration Co. He served as executive vice president of this firm until it was merged with the Geotechnical organization, remaining as president of Geotechnical Exploration Corp. until 1950. In 1950 he accepted the position of chief geophysicist with Crown Central Petroleum Corp., Houston, and remained in that capacity until the organization of Exploration Seismic in 1952.

Since joining the present organization he has been in charge of geophysical research and interpretation on a consulting basis in Caracas.

Lane-Wells Expands Home Office, Plant Facilities

General expansion of the home office and plant facilities of Lane-Wells Co., Los Angeles, and the enlargement and more efficient use of buildings to provide greater service for customers were announced recently by Rodney S. Durkee, president.

The engineering and patent departments have been enlarged, new test pits and other facilities installed. The sales department has been moved to new and enlarged quarters in its own building, the shipping department and steel storage departments have been reorganized, and other changes made.

This is in line with growth of the company's business development program which included doubling in size of the company's site through the acquisition 2 years ago of a 5-acre tract adjoining the original location at the rear. The original site, in the heart of the Los Angeles industrial area, was acquired in 1936, and floor space in buildings erected during the first year has been increased over 10 times through new buildings and additions.

Colby Named to Represent Three Houston Firms

Colby Export Co., Houston, has been appointed exclusive export sales representative for three Houston concerns, according to an announcement made by Charles L. Colby, president.

The firm will represent in all Latin America, except Cuba and Puerto Rico, Coast Paint & Lacquer Co., Inc., manufacturers of industrial paints and lacquers and of anticorrosive Copon.

Throughout Latin America, Colby will represent The Bettis Corp., manufacturer of plastic pipe, water coolers, and other specialty items.

For Johns Brothers Machine & Manufacturing Co., makers of power mowers, lawn edgers, and trimmers, Colby will be exclusive representative throughout Latin America, Europe, and the Union of South Africa.

Mr. and Mrs. Colby will emplane on a business trip to Caribbean and South American markets in September. Among the cities on their itinerary are Havana, Mexico City, Bagota, Medellin, and Caracas.

Colby Exports Co. is owned and operated by Mr. and Mrs. Charles L. Colby, of Houston, both of whom have spent much of their lives abroad and are experts in international markets and buying habits.

Coast Paint & Lacquer Co., Inc., moves to enlarge its distribution with the appointment of Colby Export Co. as Latin American representatives. Left to right: Mrs. Georgine C. Colby; Carl J. Seefeld, CP&L vice president and general manager; Charles L. Colby; and Ray Wolfe, CP&L district sales manager.

STURDYBILT

PREFABRICATED HOUSES . . . are RIGHT for the OIL INDUSTRY

Mobile, unitized drilling equipment did much to speed up drilling operations. In the same way, STURDYBILT Prefabricated, Demountable Houses speeded up getting men and equipment under cover in a hurry.

STURDYBILT houses, garages, warehouses and other buildings that can be set up in days instead of weeks, and can be moved when necessary, are best for field Housing. They are RIGHT for the oil industry.

MANUFACTURERS OF SPECIAL MILLWORK; DISTRIBUTORS OF JOHNS-MANVILLE BUILDING MATERIALS; CURTIS WOODWORK

STURDYBILT PREFABRICATED, DEMOUNTABLE HOUSES

SOUTHERN MILL & MANUFACTURING CO. ● TULSA, OKLAHOMA

STURDYBILT HOUSES COMPLY WITH COMMERCIAL STANDARD CS125 OF THE NATIONAL BUREAU OF STANDARDS FOR PREFABRICATED HOMES

Cooper-Bessemer Promotes Gallogly to Chief Engineer

D. L. GALLOGLY

Dennis L. Gallogly has been appointed chief engineer, product division, Cooper-Bessemer Corp., Mount Vernon, Ohio, according to Ralph L. Boyer, vice president and chief engineer. Gallogly replaces Robert F. Lay, recently elevated to assistant general sales manager of Cooper-Bessemer.

In his new position, Gallogly is one of three chief engineers who now head the company's key engineering groups. Others are W. R. Crooks, chief engineer, development division, and T. O. Kuivinen, chief engineer, technical division.

The product division, under the direction of Gallogly, is responsible for the engineering-manufacturing liaison, application, and service of all Cooper-Bessemer engine and compressor equipment. The development division, under Crooks, institutes new designs and includes all research and experimentation. Kuivinen's technical division comprises stress analysis, torsional vibration, and other mathematical computations, metallurgy, fuels, lubricants, and technical publications. It serves both other divisions.

Cooper-Bessemer's engineering organization plan is headed by Ralph L. Boyer, vice president and chief engineer. The programs of the three divisions are coordinated by E. Frederick, executive engineer.

Gallogly's 24 years of continuous service with Cooper-Bessemer include responsibility for compressor calculations and compressor experimentation. Appointed supervisor of the company's test floor at Grove City, Pa., plant in 1934, Gallogly later became service manager of the Mount Vernon plant where the company makes its headquarters.

Several personnel changes in the product division have been announced by Gallogly. Samuel F. Lamb now becomes service manager, the position formerly held by Gallogly. Manager of application engineering is Richard F. Kymer. Assistant manager of application engineering is Edward D. Newell.

The department of manufacturing liaison is now managed by Ellsworth L. Lerch. Lerch will be assisted by Leonard Helser. The position of resident engineer, Grove City plant, vacated by Lerch's promotion, will be filled by John Konkler.

Franklin Supply Elects Officers

At the annual board of directors meeting of Franklin Supply Co., held recently in Chicago, the following officers were elected to serve for the forthcoming year: Jene Harper, president; Roy Wood, vice president; Leland Strouse, vice president; Lawrence Harper, vice president; Albert Mitchell, treasurer; and William P. Quan, secretary.

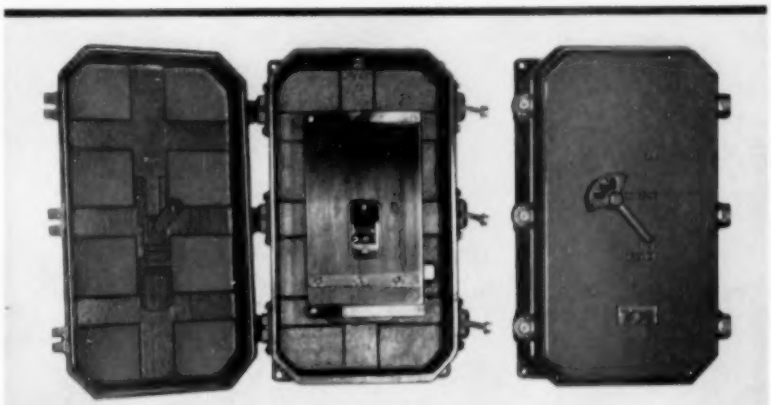
Graver Water Conditioning Names Fosnot Sales Manager

Harold R. Fosnot has been made sales manager of Graver Water Conditioning Co., division of Graver Tank & Manufacturing Co., Inc., New York, according to H. T. Sulcer, vice president and general manager.

Fosnot joined Graver upon graduation from Purdue University in 1935, and became a member of Graver's first training program. He was previously Chicago district manager, Eastern sales manager, and most recently assistant general sales manager.

Specify NELSON

WATER-TIGHT & DUST-TIGHT AIR CIRCUIT BREAKERS



Inside and outside views: Nelson 225-ampere frame, 3-pole, 250-volt breaker with 125-ampere trip rating.

Designed to provide automatic fuseless protection and control for power and lighting circuits, Nelson water-tight and dust-tight (NEMA IV & V) air circuit breakers:

1. Utilize thermal-type breakers, assuring dependable circuit protection.
2. Enclosures of high tensile cast iron are produced in our own foundry.
3. Hinged covers are securely held in place by swing bolts. Rubber gasket excludes dust.
4. Breakers can be furnished in ratings up to and including 600 amperes, 600 volts.

Write for descriptive bulletin.

NELSON Electric MANUFACTURING CO.
TULSA, OKLAHOMA

217 N. DETROIT AVE. TELEPHONE 2-5131

Where New Horizons Begin

General's laboratory is under the direct supervision of Dr. Lewis M. Mott-Smith who has had a long, distinguished career as a scientist. He received his Ph. D. from California Institute of Technology in 1926 and came immediately to Houston as a Physics Instructor at Rice Institute, remaining in that position until 1938. From 1935 until 1941 he was President of the Mott-Smith Corporation, Gravimeters and Gravity Surveys. In 1941 he went to Washington and from 1941 to 1946 did war research work. For his outstanding work on the proximity fuse, Navy fire-control equipment and guided missiles he received the Presidential Certificate of Merit. He has been with General, as Director of the Laboratory, since 1946.

Dr. Mott-Smith is a Fellow of the American Physical Society, a member of the American Geophysical Union and the Society of Exploration Geophysicists.

William J. Gundlach, right, Superintendent of the Laboratory, and Dr. Mott-Smith discussing some of the precision instruments developed by General Geophysical Co.

Here in General's laboratory in Houston constant research is carried on to improve field techniques and instruments, making possible the expansion of new horizons on geophysical frontiers. These developments provide General's 30 field crews working in Canada, throughout the United States, and offshore with the most modern equipment available in their search for new oil reserves.

General's research program is leading the way in the development of new exploration techniques. Experience in every important oil province on the North American continent has given General's crews the skill required for accurate mapping of new or old areas. You can depend on the accuracy of General's exclusive climate-proofed equipment and seasoned crews to help you when exploring for new horizons.

General GEOPHYSICAL COMPANY
GULF BUILDING • HOUSTON, TEXAS

Simpson Group Jumps Into Oklahoma News

by John C. McCaslin

DEEP drilling has come up with some real news-making discoveries in the Bradley area of eastern Grady County in southwestern Oklahoma, the state's current hot spot. The objective of the deep program is the rich, thick Simpson group, one of the most promising reservoirs in Oklahoma.

Biggest development at Bradley field in recent weeks is the establishment of Oklahoma's deepest oil production at Phillips Petroleum Co. 1 Steve, in SE NE 35-5n-5w, 1½ miles southeast of the town of Bradley. This multizone discovery well flowed 411 bbl. of 49.5°-gravity oil per day through a small choke from 60 ft. of perforations in the deep Oil Creek formation between 13,735-13,804 ft. A gas well in Caddo County, completed in 1948, still holds Oklahoma's deepest production record. It is Denver 1 School Land in Cogar field. Production is from the Hunton lime at 14,510 ft.

Phillips successfully tested a third flowing pay sand at the 1 Steve. The well flowed at the rate of 327 bbl. of 48.1°-gravity oil per day through a small choke from perforations in the third Bromide sand between 12,885-12,973 ft. and 13,002-50 ft. The well previously flowed 728 bbl. of oil per day from basal McLish perforations at 13,294-13,325 ft. This is the first production in the immediate area from the Oil Creek, McLish, and third Bromide formations. Phillips also has tested the first and second Bromide sands at the well. Drilling of two more deep tests near the 1 Steve is proceeding, and the company is moving in equipment to start another test 1 mile northeast. Phillips' stepout activity in the area is rapidly connecting Southeast Bradley and Bradley pools.

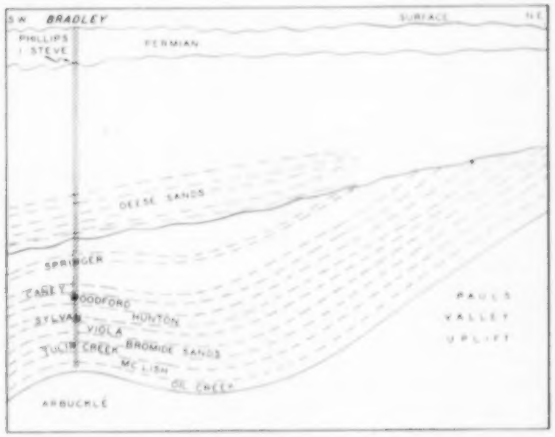
The latest impetus to the deep-drilling spree in the general Bradley area is Gulf Oil Corp.'s 1 Costello in C NE SE 14-5n-5w. This wildcat flowed oil at the estimated rate of 54 bbl. per hour for 2 hours on drill-stem test at 11,650-11,701 ft. in the first Bromide.

Three pools . . . Bradley pool was opened last fall by Phillips at 1 Lack for a flow of 75 bbl. of oil per day from Springer sand perforations at 9,430-40 ft. The pool seems to be a pre-Pennsylvanian structure that is possibly faulted on the northwest side. The dip is to the southeast at about 250 ft. per mile. Between the Chitwood anticline, where only four wells have gone into pre-Pennsylvanian rocks (two of which found Simpson oil), and the Bradley structure there is a long synclinal trough which becomes deeper to the northwest.

Southeast Bradley pool is on a structural nose that plunges toward the northwest. This field has Springer and Hart sand production. Northeast Bradley pool, opened at Gulf 1 Mainka in 1949, was completed flowing 1,068 bbl. of oil per day and 10,000 M.c.f. of gas per day from the second Bromide sand. The well was later deepened and completed in the first Bromide and Tulip Creek. McLish and Hunton production were added later.

Regional environment . . . The Bradley area lies in the southeastern embayment of the Anadarko basin, close to the basin axis. The Chitwood and Knox faulted anticlines are the dominant tectonic features to the west of Bradley, and to the southeast, separated by a long synclinal trough from the Chitwood structure, there is a northwest-plunging anticline that trends approximately parallel with the Pauls Valley uplift.

The Simpson group is divided into four formations; the Bromide, McLish, Oil Creek, and Joins. Each has a basal sandstone followed upward by a sequence of varying lime, dolomite, sand, and green shale. The Bromide sands are very well developed, being thick and porous over most of the area.



Generalized cross-section—Bradley to Pauls Valley uplift.

The Bromide and McLish sands in the embayment attain a thickness of several hundred feet. There are multiple source beds in this area of the Anadarko basin that are in contact with major unconformities and porous carrier beds.

The Oil Creek sand was laid down over much of Oklahoma and probably northern Texas as the Simpson seas invaded the region. It is related to the Bodcaw of northern Louisiana, the Tensleep of Wyoming, and the Woodbine of East Texas, in that it is a blanket sand. Production from these sands is regional in importance rather than local. The Oil Creek varies in thickness from 450 to 600 ft. in the Chitwood area of Oklahoma.

The Simpson group facies were to some extent influenced by gentle structural movements, during or just prior to the Simpson deposition. Between Iron Chapel and the Lindsay area the Simpson grades, in a rather short distance, into a sand facies which continues south to the Arbuckle Mountains. Here the sands are very permeable and porous, providing excellent reservoirs.

The Simpson group offers prolific possibilities for the southeastern embayment area. It thins rapidly to the north offering many stratigraphic-trap possibilities. Many structures in the area which have been found productive in Pennsylvanian rocks have not been drilled to the Simpson due to the great depths involved, but it appears that the southeastern embayment of the Anadarko basin can expect a big Simpson boom in the near future.

Order Is Emerging Out of Chaos

Geologists will hail efforts of the North Dakota Geological Society to standardize Williston nomenclature

by John C. McCaslin

IN over 3 years of exploration and development in a virgin territory, such as Williston basin, a great deal of subsurface information can accumulate. Many decisions can be made, and many ideas can emerge from this wealth of information.

Numerous geologists have worked in the Williston basin before and since the discovery of oil there. By studying the various logs of many wells in the area they have been called upon to differentiate the various formations of the entire geologic section. Each has had different ideas about the thickness, extent, oil possibilities, and nomenclature of the many formations. The result has been confusion, which is only natural in a new area of such great extent.

The North Dakota Geological Society has taken the first important step toward clearing up some of this confusion. Through the hard work of a lot of people and hours of midnight oil the society has come up with the first guide to a common Williston basin nomenclature. In its "Stratigraphy of the Williston Basin" and accompanying composite electrical log the society has given the geologist a valuable rule for formation nomenclature. Further drilling will bring greater expansion of geologic knowledge in the basin. This expansion will cause revision and addition to this first important step.

The Williston basin has 11 formations presently producing, and a twelfth has been proved commercial, but is not now being produced. These formation represent six geologic ages. They are:

"Amsden"

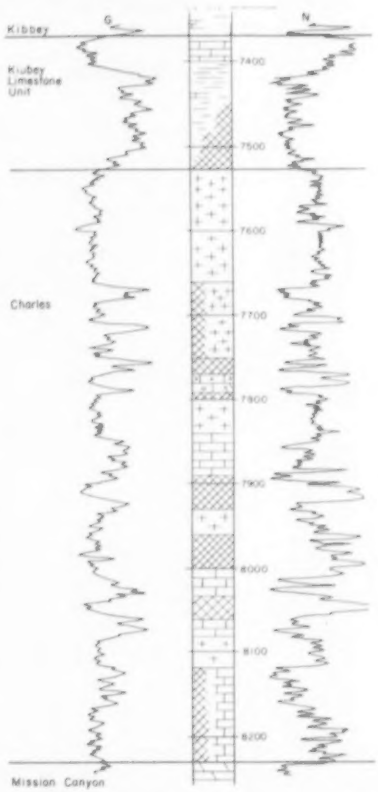
One of the Williston basin's new pay formations is the "Amsden" of Pennsylvanian age. Amerada Petroleum Corp. completed the first producer in this formation at 1 Cheadle in Fryburg field, Billings County, North Dakota. The new-pay discovery well flowed at the rate of 97 bbl. of oil per day. Fryburg also produces from the Mission Canyon. The particular pay sand at Fryburg is called the Fryburg sand.

Madison Group

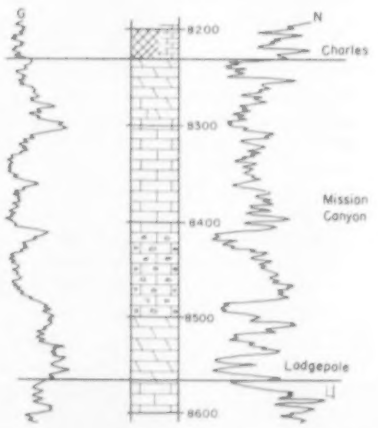
The first oil discovery in the basin at Virden, Man., got its production from this group. It is the leading producer in the Williston basin.

North Dakota's Nesson anticline fields all produce from the Madison Group. These fields have been rapidly developed in the 8,000-9,000-ft. level. Production in Montana's East Poplar unit is also being developed in the Madison Group. Wells in this unit initial 250-2,000 bbl. of oil per day.

Madison production has also been established in North Poplar field, West Richey, Wolf Point, and Woodrow fields in Montana. Recently an important wildcat in the North Sidney area of Montana indicated Madison production. This wildcat was unsuc-



Electrical log showing Kibbey limestone unit and Charles at Amerada 1 Bakken, 12-157n-95w, Williams County, North Dakota. . . .



. . . and the underlying Mission Canyon formation at the same well. Both belong to the Madison group, the basin's biggest producer.

Formation	Age	Area
	Cretaceous	Wapella, Sask.
	Jurassic	Wapella
"Amsden"	Pennsylvanian	Fryburg (Fryburg sand)
Charles	Mississippian	East Poplar, Richey, Woodrow
Mission Canyon	Mississippian	Nesson anticline fields, Fryburg, Eastern Montana, Canada
Lodgepole	Mississippian	"East Flank" fields
Bakken	Mississippian	Sanish (Sanish sand)
Dawson Bay	Devonian	Duck Creek
Duperow	Devonian	Beaver Lodge and Croff (Not being produced)
Interlake	Silurian	Sand Creek, Duck Creek, Cabin Creek, and initial production from Beaver Lodge
Stony Mountain	Ordovician	Pine Unit
Red River	Ordovician	Most Cedar Creek anticline fields.

cessful, however. There is no production at less than 10,000 ft. in eastern Montana except at Sun Oil Co. 2 Dynneson in Brorson field and in East Poplar field. The North Sidney Madison tests were made at the 9,000-ft. level. Other Mississippian showings have been reported in the general eastern part of Montana.

The Madison group is divided into three formations: the Charles, Mission Canyon, and Lodgepole, all of which are productive.

Charles . . . The Charles contains porosity zones in limestone beds which are productive at Richey, Woodrow, and East Poplar fields, Montana, and which have showed for oil in North Dakota.

The base of the last salt in the Charles has been used as a division line between Charles and Mission Canyon. It is thought that the base of the massive anhydrite below the last salt, and above the first carbonate porosity zone, is a more accurate division point. This point is also more readily correlated with Mission Canyon tops in the shallow parts of the basin.

Mission Canyon . . . This formation, productive in North Dakota Nesson anticline fields, Fryburg, eastern Montana, and Canada, is the biggest target in the basin.

The Mission Canyon has shown for oil in many deep tests in the basin. Its top is picked at the top of the porosity zone in fragmental limestone or dolomite which occurs beneath a massive anhydrite or below the last salt bed.

Lodgepole . . . This formation, the lower member of the Madison group, is productive from porosity zones in fields along the northeast flank of the basin.

The Lodgepole correlates with Montana's Woodhurts and Payne formations, and with the Banff of Alberta, and in part with the Englewood of the Black Hills. It is conformable under the Mission Canyon, and is locally unconformable upon the Bakken. On the Cedar Creek anticline of Montana unconformable conditions exist at the base of the Lodgepole.

Basal Mississippian

Another new pay in the basin is the Sanish sand. Stanolind Oil & Gas Co. completed the first Basal Mississippian discovery in the basin at 1 Starr in the West Sanish area of McKenzie County, North Dakota.

The discovery flowed 550 bbl. of oil per day. The Sanish sand is a member of the Bakken formation. Good gas and oil shows have been reported in deep Williston basin wells from the Bakken, making it an objective of considerable interest. The Sanish sand at the 1 Starr is believed to be an unconformity sand lying below the lower black shale.

Devonian

The Devonian in the Williston basin consists of eight formations. Two of these formations produce in the basin, the Dawson Bay at Duck Creek, and the Duperow (has produced at Beaver Lodge).

Best development of the Devonian rocks in the Williston basin occurs in north-central and northwestern North Dakota, and in southwestern Manitoba.

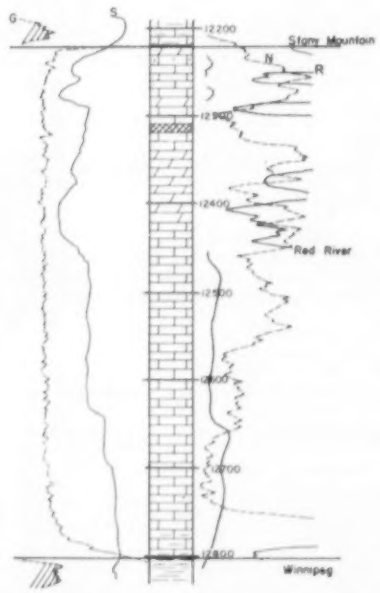
Silurian

The Interlake formation of Silurian age produces at Sand Creek, Duck Creek, and Cabin Creek. The Silurian should be included in North Dakota, as the first commercial production in that state was from the Interlake at the 1 Clarence Iverson discovery well.

Ordovician

There are four formations in the Ordovician in the Williston basin. Two of these are productive, the Stony Mountain and the Red River.

The Stony Mountain in part can be correlated with the Maquoketa of Iowa. Faunaly, upper Stony Mountain represents a gradual transition from Upper Ordovician to Silurian with no apparent break. Best correlation horizon is the lower Stony Mountain member. The Stony Mountain produces at Pine Unit, Montana.



Electrical log of the Red River in Amerada 1 Herman May, 9-139n-100w, Billings County, North Dakota, discovery well of Fryburg field.

The Red River is a limestone and dolomite with a minor amount of anhydrite in the center of the basin. Its lateral extent may be greater than is presently known, possibly overlapping underlying formations. It produces at Brorson, Montana's deepest production, Cabin Creek, Deer Creek, Glendive, Little Beaver, Pine Unit, Sand Creek, Yellowstone, and most recently at Custer pool in South Dakota.

Future Pays

In the Saskatchewan portion of the Williston basin there is production at Wapella field in the Cretaceous and Jurassic sands. Socony-Vacuum Oil Co., Inc. recovered a showing of oil from the Otter (Mississippian) formation. The Otter show was encountered at 6,980 ft. in the company's Teepee Buttes wildcat in Hettinger County, southwestern North Dakota. Future discoveries are probable in rocks of these ages.

CANADA

Jurassic Oil Found In Pembina Region

The Socony-Seaboard-Merrill-Cancoll team that discovered the first Cardium sand light-gravity crude oil in the Pembina region of west central Alberta about 16 months ago, has indicated prospects for commercial oil production in the Jurassic at a driller in the Violet Grove sector of that region, about 65 miles southwest of Edmonton. This current driller, now indicated as a Jurassic oil discovery, also gave up a substantial gas flow from that same formation. The well had previously yielded some free oil in Blairmore formation.

The venture is Socony-Seaboard 7-6 Violet Grove, LSD 6, 7-48-7w5, 1¼ miles east-southeast of the Socony-Seaboard 12-12 Pembina Cardium sand oil well, 5¼ miles west-southwest of the team's 13-14 Violet Grove Mississippian oil well, and 2¾ miles south of the 30-2 Violet Grove venture that found basal quartz oil. Like the group's other wells in the region, it is owned by Socony-Vacuum Oil Co. of Canada, Ltd., Seaboard Oil Co., Honolulu Oil Corp., Merrill Petroleums, Ltd., and Cancoil Oil & Gas, Ltd.

The Jurassic was entered at about 6,745 ft., or 3,862 ft. below sea level (K.B. elevation 2,883 ft.). A 75-minute drill-stem test from 6,739 to 6,758 ft. flowed gas to the surface in 1 minute, at maximum rate 1,170,000 cu. ft. daily, decreasing to 857,000 cu ft., and recovery was 10 ft. of clean oil. Second reported test in that formation was from 6,758 to 6,773 ft. for 1 hour. Gas flowed in 2 minutes at maximum 140,000 cu. ft. daily, and pipe recovery consisted of 616 ft. of clean oil and 10 ft. of gassy mud. Hole is currently being reamed at total depth 6,773 ft.

Earlier the well had entered the Blairmore at 6,114 ft., or 3,231 ft. subsea, and a 1¼-hour drill-stem test from 6,611-68 ft. flowed gas in 3 minutes at rate 428,000 cu. ft. daily. Recovery was 5 ft. of oil with gravity of 40°.

After entering the basal quartz at 6,634 ft., or 3,751 ft. subsea, three drill-stem tests were run, giving the following results: Interval

6,674-6,732 ft., gas at rate too small to measure, recovered 30 ft. of gas-cut mud in 1 hour: interval 6,700-34 ft., misrun; retest interval 6,700-34 ft. for 1½ hours, gas in 62 minutes at small rate, recovered 10 ft. drilling mud.

TEXAS

EAST TEXAS

Gas-Distillate Field Opened in Harrison

A new gas-distillate pool has been opened in Harrison County, 2½ miles east of South Hallsville field in the GH&H Survey 1 A-292.

The discovery well is Gilster Kemp 1 Harris, southwestern Harrison County and 12 miles southwest of Marshall. It was completed for a calculated open flow potential of 2,000 M.c.f. of gas per day plus 60 bbl. of 64.4°-gravity distillate per million cubic feet. Production is from perforations in the Pettit lime at 6,502-33 ft.

Hopkins County Has New Paluxy Oil Field

F. R. Jackson 1 Pearl Spencer, Paluxy discovery 9 miles northeast of Sulphur Springs in eastern Hopkins County was completed on pump for 168 bbl. of 53°-gravity oil in 16 hours.

The pool opener is located in the G. Linceum Survey.

SOUTHWEST TEXAS

Mayo Field Discovery in San Patricio Runs Gage

Haroldson L. Hunt, Jr., Trust Estate and Kirwood & Co., have run open flow at 1 Mayo, Mayo field discovery well 4 miles southwest of Taft, San Patricio County.

The discovery well flowed 20,500 M.c.f. of dry gas per day from perforations at 2,632-38 ft. The new pool is about 2 miles south of South Taft field. It is 2 miles north of East White Point field.

NORTH TEXAS

Jack County Records New Strawn Discovery

Jack County has a new Strawn producing area at Triad Drilling Co. 1 Steward, 7 miles southeast of Antelope.

The flowing well gaged 113 bbl. of 42°-gravity oil per day on 24/64-in. choke from perforations at 3,751-53 ft. The new pool will be called Triad Strawn. It is located in the NW¼ Section 2, BBB&C Survey A-1916. It is 1½ miles northeast of Ada Strawn oil field.

Another Strawn well . . . More Strawn production was established in North Texas' Young County at Rankin, Karper and General Tire & Rubber Co. 1 Wilmoth Robertson, 3½ miles northeast of Graham.

The 1-mile discovery flowed 72 bbl. of 41°-gravity oil on 8/64-in. choke in 24 hours through perforations at 3,544-551 ft. in the Strawn. The well is in the TE&L Survey 1577 A-927.

Archer County . . . Archer County has a new oil discovery at Harvey Drilling Co. 1 Muerer, 4 miles southwest of Windthorst.

The sand strike was completed at 3,496 ft. pumping 96 bbl. of 41.8°-gravity oil per day. It is ¾ mile east of other production in Block 79, Clark & Plumb Subdivision.

An extension well at Bill Lisle et al 1 Ickert, 4 miles southeast of Megargel and ½ mile north of other oil, gaged 22 bbl. of 39°-gravity oil per day on the pump. Pay is from 1,202 ft.

Caddo Lime Discovery Completed in Throckmorton

D. G. Gordon has a new Caddo lime oil discovery 8 miles southeast of Throckmorton at 1 Lunsford.

The well rated 310 bbl. of oil in 24 hours from perforations at 4,098-4,108 ft. The Caddo discovery, opening Lunsford-Caddo field, is located in subdivision 49, Travis County School Land Survey. The oil is 43°-gravity.

Jack area . . . A new shallow pay sand in Avis East Bryson field, Jack County, has been established at J. C. Man, Jr. et al 1 Anna Pettos.

The new-pay discovery well flowed 245 bbl. of oil on ¼-in. choke from perforations at 2,546-55 ft. in 24 hours on official test. The well is in the L. M. Broadstreet Survey A-1034.

New Wise gas pool . . . Lone Star Producing Co. has completed a new gas discovery in Wise County, 7 miles south of Bridgeport in the J. M. Wesson Survey A-877.

The 1-A Bogy finaled for a potential of 2,400 M.c.f. of gas per day. Pressure was 500 psi.

TEXAS GULF COAST

Stratton Ridge New Pay Gas Well Is Gaged

The Brock "A," new-pay discovery in the Stratton Ridge area of Brazoria County, has been gaged by E. Cockrell, Jr.

The well flowed 23,800 M.c.f. of gas per day from Siphonia sand perforations at 5,965-75 ft. Location of the dry gasser is 4 miles east of Clute in the S. F. Austin ½ League, A-21.

WEST TEXAS

Sutton Wildcat Is Good Distillate Discovery

Ray Morris Drilling Co. 1 H. A. Thomson estate, Canyon sand discovery 7 miles northeast of Sonora, has been completed for an open-flow potential of 24,500,000 cu. ft. of gas, plus 195 bbl. of distillate. Pay section was perforated from 5,218-60 ft. and fractured with 8,000 gal.

Ellenburger prospects slim . . . Gulf Oil Corp. and Phillips Petroleum Co. 1 Toyah Unit, Pecos County deep wildcat, encountered salt water on its first two tests in the Ellenburger. Field sources said operator would drill additional hole before plugging back to try for completion in the Silurian.

First test in the Ellenburger, from 14,787-14,888 ft., developed a gas flow and recovered brackish water. Second test, from 14,963-15,038 ft., in dolomite, developed a flow of gas in 2 hours and 40 minutes, after which it flowed salt water. Gas flow ranged from 4,500,000 cu. ft. daily at the start, to 1,500,000 cu. ft. after 1 hour.

WEST CENTRAL TEXAS

Stonewall . . . A new wildcat oil discovery well flowing at a potential rate of 396 bbl. per day in Stonewall County, Texas, has been announced by Sunray Oil Corp.

The new well, Sunray's 1 M. C. Johnson, is ¾ of a mile from production in Flower field, and the completion may be a northern extension of this field, southeast of the town of Aspermont.

The well was completed to total depth of 4,270 ft., and is producing from the Canyon series, having penetrated 42 ft. of producing pay sand. The oil is 38.5°-gravity, gas-oil ratio 456:1, 70 psi. tubing pressure.

Sunray has a 100 per cent interest in three one-quarter sections surrounding the successful test, and has staked location for an east offset 467 ft. from the south and west lines of SE 4, Section 22, H&TC RR. Co. Survey, Block D.

OKLAHOMA

Costello Well Flows More Oil From More Pay

Gulf Oil Corp.'s important 1 Costello, Grady County discovery well in the C NE SE 14-5n-5w is flowing oil to tanks with 9,000 M.c.f. of gas per day.

This is the third test in the Bromide sand to flow oil. The test is at 11,714-49 ft. A drill-stem test at 11,650-11,701 ft. flowed 54 bbl. of oil per hour for 2 hours. A test at 11,681-11,701 ft. flowed 46 bbl. of oil in 2 hours with 11,700 M.c.f. of gas per day. The gas decreased later to 10,500 M.c.f. per day. Recovery was 3,788 ft. of free 56°-gravity oil.

Grant County Discovery Finaled in Two Zones

Two producing zones were good for 200 bbl. of oil per day at a new dually completed discovery well in Grant County.

Carter Oil Co. et al 1 Hodges heirs, NE NW NW 23-26n-5w, flowed 216 bbl. of new oil in 24 hours on 9/64-in. choke from perforations at 5,796-5,800 ft. in the Marshall sand. The well flowed 210 bbl. of oil per day on 9/64-in. choke from perforations at 5,758-62 ft. in the Simpson dolomite.

Oil Flows at Grant County Discovery

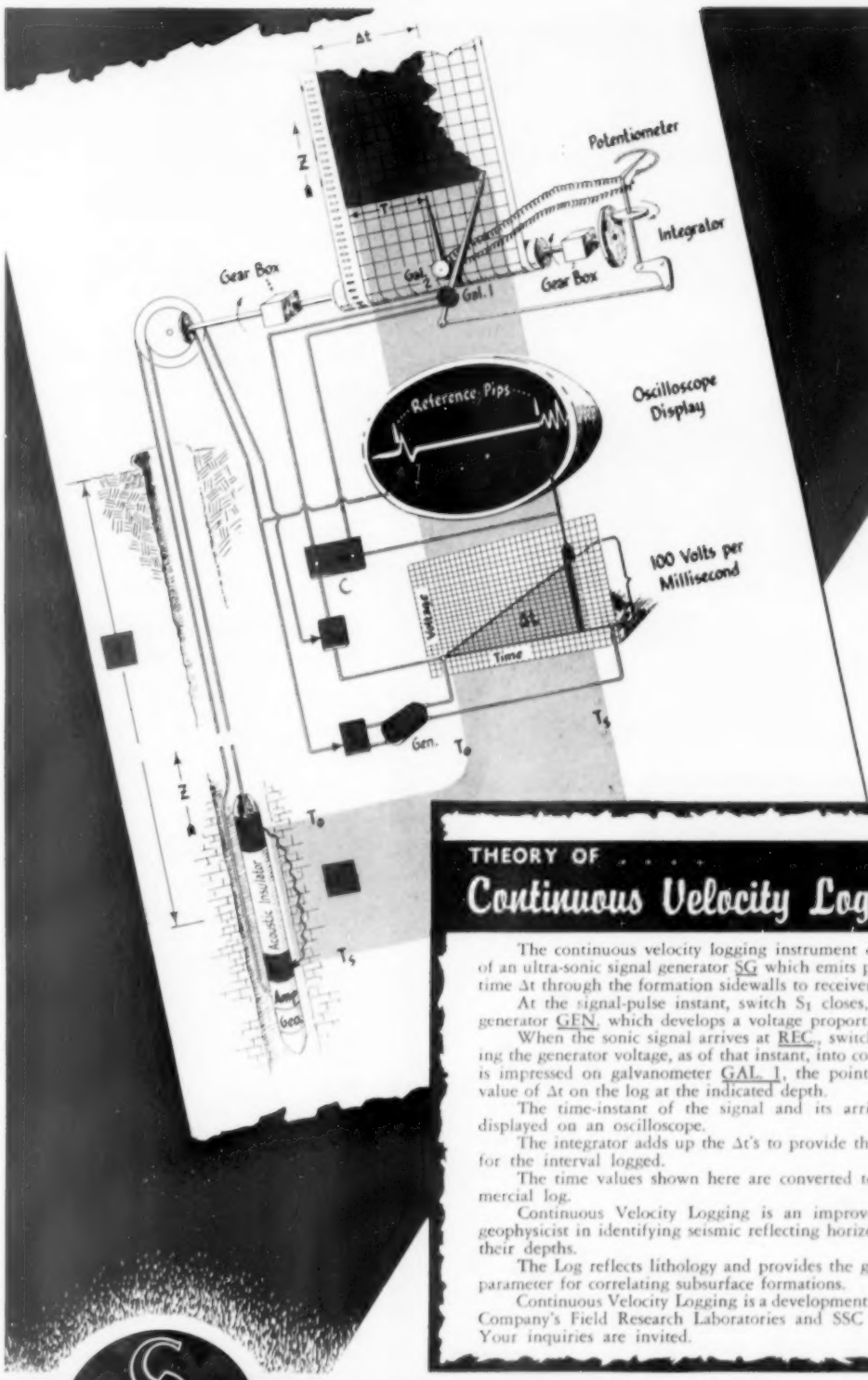
Carter Oil Co. et al 1 Hodges heirs, discovery well in NE NW NW 23-26n-5w, Grant County, flowed 53 bbl. of new oil in 6 hours on 9/64-in. choke after mud acid treatment.

Production is from perforations in the Simpson dolomite at 5,758-62 ft. The discovery also had indicated Marshall sand pay. A drill-stem test in that sand at 5,802-13 ft. flowed oil at the estimated rate of 5 bbl. per hour.

More Big News in Bradley Area of Grady

The general Bradley area of eastern Grady County has a new discovery in the making at Gulf Oil Corp. 1 Costello, C NE SE 14-5n-5w.

The wildcat flowed oil at the estimated rate of 54 bbl. per hour for 2 hours on drill-stem test at 11,650-701 ft. in the first Bromide



THEORY OF
Continuous Velocity Logger

The continuous velocity logging instrument diagramed here consists of an ultra-sonic signal generator SG which emits pulses that travel during time Δt through the formation sidewalls to receiver REC.

At the signal-pulse instant, switch S_1 closes, starting the saw-tooth generator GEN. which develops a voltage proportional to time.

When the sonic signal arrives at REC., switch S_2 is closed discharging the generator voltage, as of that instant, into condenser C. This voltage is impressed on galvanometer GAL. 1, the pointer of which traces the value of Δt on the log at the indicated depth.

The time-instant of the signal and its arrival time at REC. are displayed on an oscilloscope.

The integrator adds up the Δt's to provide the overall travel-time T. for the interval logged.

The time values shown here are converted to velocity on the commercial log.

Continuous Velocity Logging is an improved method to aid the geophysicist in identifying seismic reflecting horizons and in determining their depths.

The Log reflects lithology and provides the geologist a new physical parameter for correlating subsurface formations.

Continuous Velocity Logging is a development of Magnolia Petroleum Company's Field Research Laboratories and SSC is a licensed operator. Your inquiries are invited.

SEISMIC SURVEYS — GRAVITY SURVEYS — PILOT CREWS — LORAC — VELOCITY LOGGING

Seismograph Service Corporation

TULSA, OKLAHOMA, U.S.A.

sand. Gravity of the oil is 54°. The gas volume was 5,180 M.c.f. per day.

The well is also an indicated Viola lime discovery after gas flowed on drill-stem test at 11,395-460 ft. Recovery was 300 ft. of oil and 430 ft. of gas-cut mud.

More Grady Success

A good drill-stem test is reported at Max Pray 1 Louise Billy in C SE NE 4-4n-5w, Grady County, adding to the steam in this hot exploratory area.

A drill-stem test at 9,900-35 ft. in the Springer sand recovered 2,850 ft. of free oil after flowing gas in 1 hour. This wildcat is the northeast offset to Stanolind Oil & Gas Co.'s 1 Briscoe, famous deep test in this area.

LOUISIANA

SOUTH LOUISIANA

Dixon Bay in Plaquemines Gets a New Oil Sand

A new oil sand has been established in the new Dixon Bay field of Plaquemines Parish by The California Co. at 1 Armstrong, confirming pool production.

The well flowed 130 bbl. of oil on 7/64-in. choke from perforations at 8,732-49 ft. Gravity is 30.7°. Gas-oil ratio was 676:1. The 1 Armstrong is about 1 mile northwest of the discovery well. The third test in the field is under way, the 2 Armstrong.

ARCCO
NOW SPECIFIC GRAVITY RECORDING OF LIQUIDS AT ANY DISTANCE
RECORDING TRANSMITTER
Accurate long-distance transmission of specific gravity recordings is no longer a problem with the new Arcco-Anubis Metameter Recording and Transmitting Liquid Gravitometer. This instrument combines the mechanism of the standard Arcco Liquid Gravitometer with a metameter telemeter transmission system which records and transmits the specific gravity record to control room or other remote location. The interconnecting line may be any two-wire electrical circuit or its equivalent: private wires, telephone circuits, carrier current channels, or radio (VHF or UHF).
The range of the standard instrument is .15 or larger, but instruments with ranges of .10 or .05 can be supplied. Specific gravity charts are available for many gravity ranges, and special degree A.P.I. charts can be furnished at slight additional cost. Request Bulletin No. 111-R2B for complete details.
RECORDING RECEIVER
AMERICAN RECORDING CHART CO.
3113 E. 11th St. • Los Angeles 23, Calif.
Send For Bulletin No. 111-R2B

Midland Gas Well Completed In Acadia Parish Area

Acadia Parish's Midland gas field has a new gas-distillate well on its east edge. Atlantic Refining Co. 1 Gas Unit 1, 53-10s-1w, southwest offset to the 1 Hoffpauer, a temporarily abandoned well, flowed 101 bbl. of 54°-gravity distillate on ⅛-in. choke per day. Gas-liquid ratio was 45,600:1.

St. Charles . . . Pan American Production Co. 7 Simoneaux, southwest to Boutee production in St. Charles Parish, flowed 99 bbl. of 39.5°-gravity oil daily from 10,318-22 ft. This is the seventh well in the field.

East Lake Palourde Gets Second Oil Well Completion

Union Oil Co. of California has confirmed oil production in East Lake Palourde field, Assumption Parish.

The 1 Jeanerette Lumber & Shingle Co., 3,300 ft. northeast of the discovery well, flowed 320 bbl. of 40°-gravity oil on 9/64-in. choke. This gives the field its third producing well.

NORTH LOUISIANA

DeSoto Parish Wildcat Assured Pettit Gas

A wildcat 1⅜ miles northwest of Longstreet field in northwestern DeSoto Parish is assured gas production in the Lewis zone of the middle Pettit.

Ralph R. Gilster and James E. Kemp will complete the 1 Moseley & Garland, 25-14n-16w, after testing 12 ft. of porosity at 6,337-49 ft. Gloyd production is also indicated after a core of this Rodessa zone had 12 ft. of porosity with a show of gas and condensate.

Two New Wilcox Pools

Two new Wilcox producing areas have been opened in northeastern Concordia Parish, east-central Louisiana.

In the old Clayton gas field Billups, Gauthier & Heard 1 Miller et al, 40-8n-10e, is producing from Artman sand perforations at 5,147-49 ft. Initial flow was 138 bbl. of 41°-gravity oil per day through 9/64-in. choke.

Durbin Bond & Co., Petersen Drilling Co., and Union Producing Co. completed the discovery well of Milestone Forks. The 1 Turner, 20-8n-10e, flowed 119 bbl. of 44°-gravity oil per day through 9/64-in. choke.

July Strikes

North Louisiana recorded two oil discoveries and two new gas pay discoveries during July.

Waverly Point Wilcox oil field was opened in Concordia Parish by Wentworth and Como Drilling Co. at 2 Murray, Irregular 11-7n-10e. The discovery well was finaled flowing 106 bbl. of oil per day through 12/64-in. choke from perforations at 5,564-72 ft. It is located 1½ miles northwest of Vidalia.

A Smackover discovery was completed in Webster Parish at Hunt Oil Co. and Associates 1 Ardis C. Burns et al Unit, 9-23n-9w. The well flowed 248 bbl. of oil per day from perforations at 11,065-102 ft. through 12/64-in. choke.

New gas pays . . . Midstates Oil Corp. 1 Carter Fee, C NE SE 12-16n-10w, opened

Cotton Valley production in Bistineau field, Bienville Parish.

The well flowed 10,000 M.c.f. of gas per day plus 25 bbl. of condensate per day. Production is from the "D" sand at 7,986-8,010 ft.

A reworked well, Southwest Gas Producing Co. and Feazel 1 Redwine, Clay field discovery well in Lincoln Parish, became a "D" sand discovery for the field. It was formerly a Travis Peak gas producer.

HUGOTON EMBAYMENT

Gas Flows at Extension Well in Hansford County

Stanolind Oil & Gas Co. 1 Matthews, 5 miles southwest of Spearman, has indicated successful gas production from Morrow sand.

The well flowed 1,800 M.c.f. of gas per day from perforations at 7,372-82 ft. and 2,000 M.c.f. from 7,128-34 ft. after fracturing. The extension well is 1 mile south of R. H. Fulton 1 Matthews, recent Morrow gas strike in Hansford County. It is located in Section 117, Block 45, H&TC Survey.

Pennsylvanian Panhandle Field Seven Miles Long

The new Pennsylvanian producing area off the southeast flank of big Hugoton Permian gas field in Hansford County, Texas Panhandle, has reached a length of 7 miles.

United Producing Co. 4 Lola Jackson, is a new-pay discovery for the extension area. The 4 Jackson flowed 14,100 M.c.f. of gas per day from Morrow sand perforations at 6,586-6,606 ft. Production to the northeast is from Douglas sand.

At the northeast end of the long producing trend Humble 1 Collier "C," is the fourth oil well in the new field. It flowed 268 bbl. of 45.5°-gravity oil per day through ½-in. choke from Douglas sand perforations at 4,529-37 ft.

Kansas . . . Ohio Oil Co. has a discovery indicated at 1 Bond, NW NW SE 32-33s-30w, 2 miles west of Novinger field in Meade County.

A drill-stem test at 5,792-5,807 ft. recovered 170 ft. of gas and 240 ft. of slightly gas-cut mud.

MICHIGAN

Edward Torosian 1 H. Balko et al, NW SE SW 36-1n-7e, Lyon Township, Oakland County, the mile northwest extender of the Northville Trenton oil pool, continued to hold as top well of interest and importance in the state this week, but well, after a reacidization with 3,000 gals., was flowing at a lesser rate that it did prior to this third acid shot, would not flow steadily with agitation, and there was evidence of a possible bottom-hole water-cut.

The 1 H. Balko et al, was bottomed out in Trenton at 4,746 ft. after top was logged at 4,406 ft. Pays at 4,360-82 4,470-85 ft. were perforated with a total of 96 shots. Following first 500-gal. clean-out acidization with mud acid, well flowed at the rate of 25 bbl. of oil an hour for 2½ hours. After next 1,500-gal. treatment, well flowed at an average rate of 50 bbl. an hour for 8 hours. The next day, well was reacidized with the semi-disasterous 3,000-gal. treatment and flowed back 233 bbl. of net oil in just over

OIL FIELD

TRUCK BODIES AND TRAILERS ARE FIELD DESIGNED

BY LELAND

LELAND "PACKAGED UNIT"
Includes gin-poles, can be mounted with heavy duty winch at your option.

LELAND POLE TRAILERS
Single or Tandem Axle.

LELAND SELF-LOADING TRAILER
Single Axle and rugged.

LELAND SELF-LOADING FLOAT
Tandem Axle . . . big jobs.

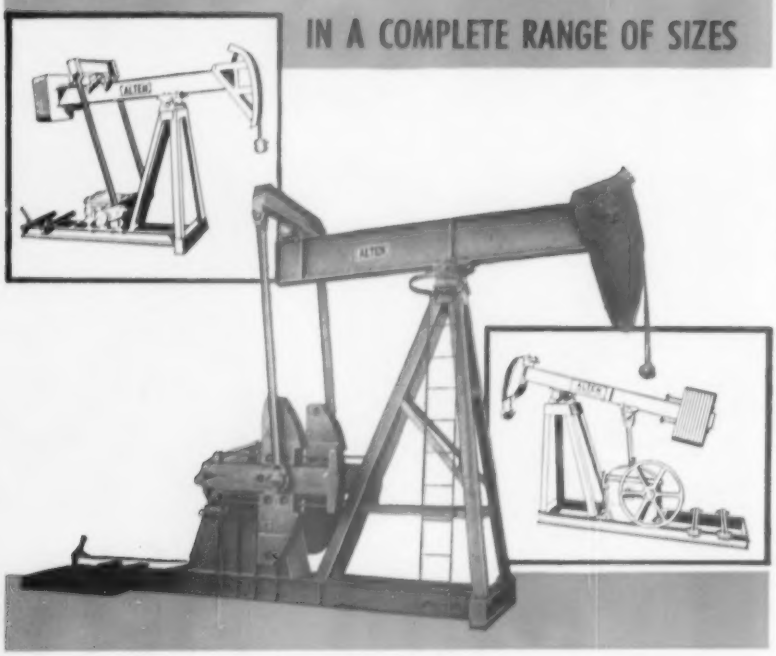
TULSA WINCH HEAVY DUTY WINCHES
Equipment, parts, service.

▲ Few oil fielders relish working with a "green hand" . . . and that goes for *truck equipment as well as personnel!* Lots of things happen to truck bodies and trailers when pressed to hard field use—a weak gin-pole pocket . . . faulty structural reinforcement. It may look good on the drawing board, but if the operator says, "no" . . . brother, you've had it! For this reason field men regularly file performance reports on the Leland line of truck bodies, initiating a continuous program of Leland design progress.

Leland
EQUIPMENT COMPANY
Oklahoma City • TULSA • Longview, Texas

ANNOUNCING NEW PRE-TESTED ALTEN PUMPING UNITS

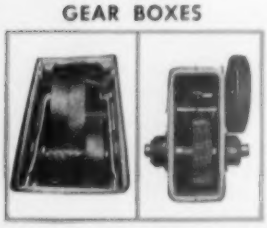
IN A COMPLETE RANGE OF SIZES



Wherever there is a need for pumping oil, Alten has a unit of ample capacity to do the job. *Alten now makes every size and makes it better.* . . . Better because Alten units spend more time operating and less time idled for repairs, maintenance and service. Every part is built for longer life and quick, easy servicing.

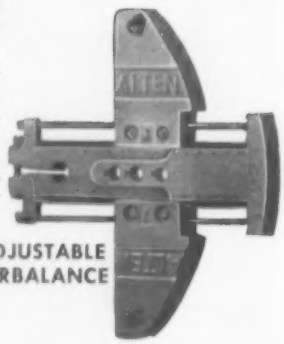
All these features can't be shown on this page, so why not take this friendly suggestion: *Be Sure To Compare Alten Before You Buy!*

TWO GREAT GEAR BOXES



Some pumping situations demand herringbone gears for peak performance, others helical. *Only Alten offers both.* No need to compromise — get the proper gear train every time.

NEW ADJUSTABLE COUNTERBALANCE



Rugged enough to meet harshest oil field requirements, yet so amazingly simple it can be adjusted in minutes by one man on the ground.

Crank calibration locates weights for desired counterbalance. Weights cannot fall during adjustments — they are safely locked in position at all times.

4 WAY ADJUSTABLE SADDLE — BRONZE BUSHED BEARING

Matchless for long wear and convenience. Simply rotate to a new bearing surface and obtain several times ordinary life. Walking beam may be adjusted laterally and to and from the well for exact centering.

BUY FROM YOUR LOCAL SUPPLY STORE

— ALTEN —
Foundry & Machine Works, Inc.
LANCASTER, OHIO

4 hours, but then flow rate, by heads showed at only about 10 bbl. of fluid an hour, showing up to a 20 per cent water-cut. This is the first oil well in the pool to show evidence of a water-drive in the Trenton, but one dry hole, the north offset to the 1 LeMaster discovery producer, was said to have logged water-bearing porosity in the Trenton. This has not been officially verified, however. It may be too early to definitely call the water-cut in the 1 H. Balko a case of bottom-hole water, but it was almost generally accepted as such. Fresh water was used to kill flow while tubing packer was removed after acid treatment, and some acid water may be part of the answer. Rods were run at mid-week to allow for agitation with a pump to keep the well flowing steadily.

KANSAS

Tanks Going Up at Harper Oil Discovery

A new Simpson sand oil strike has been made on the Kansas portion of the northern shelf of the Anadarko basin in Harper County.

Musgrove Petroleum Corp. 1 Moldenhauer, SW SW SW 27-32s-7w, flowed at the rate of 40 bbl. per hour from perforations at 4,833-39 ft. After fracturing the pay the well swabbed load and 60 bbl. of new oil in 30 minutes. Gravity is 50°. Operator is building tanks.

Barber Gas Discovery Finaled in Mississippian

Barber County in southern Kansas has a new gas pool at Imperial Drilling Co. 1 Ott "A", SE NW SW 6-34s-13w.

The discovery well was gaged for 1,846 M.c.f. of gas per day from perforations at 4,889-95 ft. in the Mississippian. The wildcat strike is 16 miles southwest of Medicine Lodge.

Sumner County Reports New Simpson Strike

Time Petroleum Co. is finaling 1 Gerberding, SE NE NE 6-34s-4w, Summer County, as a Simpson oil discovery.

The well flowed at the rate of 24 bbl. per hour following fracturing. It is 3 miles north of Bluff Creek pool in the far western part of the county.

New Pools

The Kansas Nomenclature Committee has released names of the following new producing areas in the state.

Northern shelf . . . The three counties lying along the southern border of Kansas and on the northern shelf each have new pools. In Barber County, Musgrove Petroleum Co. 1 Early, SE SE SW 4-33s-11w, is a new Mississippian gas discovery, opening North Rhodes pool. The well potentialed for 8,256 M.c.f. of gas per day.

In Harper County Dusenberry pool was opened by Wakefield et al at 1 Dusenberry, SE NE NW 3-32s-9w. It swabbed 5 bbl. of oil per hour from the Mississippian. In Sumner County Orville Parker 2 Miller, SW NW NW 19-34s-2e, opened Ashton pool as a Cleveland sand pumper. Frey Ayesh 1 Wolf, NE NW SE 24-34s-1e, is also a new

Cleveland pumper, opening Southwest Ashton pool.

Time Petroleum Co. 1 Gerberding, SE NE NE 6-34s-4w, a new Simpson oil discovery, opens Gerberding pool, also in Sumner.

Sedgwick basin . . . East Spivey pool has been opened in Kingman County at Pickrell Drilling Co. 1 Tjacen "B", NW NW SW 19-30s-7w. It is a Mississippian flowing oil well.

Southern Kansas . . . Southwest Arkansas City pool was opened in Cowley County at Martin-Cash 1 Putnam, SW SW NE 35-34s-3e. It is a Hoover oil pumper.

Hugoton area . . . Panhandle Eastern 1 Boles, inside Hugoton Permian gas production, opens Wide Awake pool in the C N½ 4-35s-34w, Seward County. It is a Toronto gas discovery.

Central Kansas uplift . . . In Barton County South Clarence pool was opened at Schermerhorn 1 Mull "A", SW SE SE 2-20s-15w, potentialling for 3,500 M.c.f. of gas per day in the Pennsylvanian conglomerate.

Frontier 1 Witt, SW SW SE 14-15s-18w, opened Southeast Leiker pool in Ellis County. It is an Arbuckle discovery. Opening Dinges pool in Ellis was Frontier's 1 Dinges, NE NE NE 9-15s-18w. It pumped 53 bbl. of Arbuckle oil per day. In Ellsworth Green Garden pool was opened by El Dorado Refining Co. at 1 Brown in NE SE NW 1-17s-9w. It pumped 25 bbl. of oil per day from the Lansing.

Imperial Drilling Co. 1 Krug, SW SW SE 10-18s-18w, Rush County, opened Northeast Rush Center. It pumped 523 bbl. of oil per day from the Arbuckle.

Saterlee pool in Stafford County was opened by Gulf Oil Corp. at 1 Saterlee, NE NE NW 31-24s-14w. It flowed 45 bbl. of oil per day from the Penn conglomerate.

MISSISSIPPI

Bolton Field Opens

Larco Drilling Co. 1 Lettie McAlpin et al, 19-6n-2w, Hinds County discovery well, was completed officially on July 30 flowing 288 bbl. of 37°-gravity oil per day through 8/64-in. choke.

Completion was from Paluxy sand perforations at 9,920-40 ft. The excellent discovery, which opened first oil production in Hinds County, has its first offset well to the south at Sun Oil-Larco's location. The Glen Rose section will probably be tested in future development wells in the new field, one of the state's outstanding.

Wilcox discovery . . . In Franklin County John S. Callon 1 Thompson, 42-5n-1e, is an assured Wilcox strike.

Oil sand was indicated at 6,319-22 and 6,391-99 ft. Testing has begun.

FLORIDA

Forty Mile Bend Field Test Staked By Gulf

Gulf Oil Corp. has reported plans and location for a new Sunniland lime test in Dade County's new Forty Mile Bend field area.

The 2 State of Florida (Lease 340), C SE NW 19-54s-36e, will go to 12,000 ft. The new test is about ½ mile southeast of the Gulf-Commonwealth Coastal 1 State, SW SW 18-54s-36e, which is producing oil from the Sunniland lime at 11,340-52 ft. The well pumped at the rate of 112 bbl. of 21.7°-gravity oil per day plus 336 bbl. salt water on completion.

APPALACHIAN AREA

OHIO

A southeast extension to Gnadenhutten pool gaging 2,300,000 cu. ft. natural gas was brought-in by Blacksten et al on 1 Mayo Denning, Lot 12, Clay Township, Tuscarawas County. Berea sand topped at 933 ft. payed at 939 ft. and 986 ft., and the well finished at 987 ft., still in sand. In the south edge of the pool, McCullough et al finished the 1 C. B. Glass, Lot 15, as a 35 bbl. natural per day pumper. Berea was found at 929-1,006 ft.

An east offset to the 1 Holman, in Marne pool, was completed after fracturing with an initial of 285 bbl. per day. Allen Willey 1 Wickham, Lot 8, Madison Township, Licking County, logged Clinton at 2,629-2,660 ft.

In the North Royalton area, H. A. Demsey 1 Chas. Hostica, Section 15, Royalton Township, Cuyahoga County, topped the Oriskany sand at 1,916 ft. and drilled-in to 1,955 ft, with a natural gage of 1,700,000 cu. ft.

WILDCAT COMPLETIONS

SOUTHWEST TEXAS

District 1

Bell County: Emory A. Dunnam 1 Hunt, William Brown Sur., A-67. Dry. TD 3,960 ft.

Burnet County: Owen & Dunavant 1 Alexander, Seaborn Berry Sur., Dry. TD 960 ft.

Guadalupe County: John H. Hueners 1 Boecher, John Baker ⅓ Lge. 26. Dry. TD 1,874 ft.

McMullen County: George H. Coates 1-B Nueces Land & Livestock, F. M. Williams Sur. 229, A-495. Dry. TD 928 ft.

Bridwell Oil Co. 7 Brownson, John McFadden Sur., A-3. Dry. TD 971 ft.

Wilson County: Texas Southern Oil & Gas Co. 2 Jung, S.&J. Arocha Sur. Dry. TD 2,870 ft.

District 4

Aransas County: Atlantic Refining Co. 1 Barber, Block 232, Burton & Danforth Subd., John H. Phillips Sur., A-175. IP 2,800 M.c.f. daily, open-flow potential, gas-condensate ratio 50,300 cu. ft. per barrel, 59.7°, Marginulina 7,014-36 ft. (perforations). TD 10,000 ft. (New field—East Aransas Pass.)

Duval County: Oceanic Oil Co. 1 Gertrude Canales estate, Sec. 13, Copita Farm & Garden Tracts, Jose Marcello Hinojosa Sur., A-628. Shut-in gas well, gas ungaged (flow 25 BCPD, ¼-in., 59°), perforations 5,050-57½ ft. (Hiawatha sand). TD 6,108 ft. (New field.)

Gus Tsemelis 1 Huizar, H&GN Sur. 19, A-315. Dry. TD 4,740 ft.

Nueces County: Alaska Steamship Co. and Newman Brothers Drilling Co. 19 Thompson, Lot 90, Nueces County Winter Vegetable Garden Subd., J.V.L. and J. de Herrera Grant. Dry. TD 6,720 ft.

Gulf Oil Corp. 1 State Lease 33105, Tract 53, Corpus Christi Bay (in Navy restricted area). Dry. TD 6,625 ft. (Stratigraphic test.)

San Patricio County: Jake L. Hamon 1-B Fischer, Tract 1, Toribio Molina Sur., A-18. Dry. TD 7,512 ft.

J. P. Petkas 1 Rinke, Victoriano Juarez Sur., A-11. Dry. TD 5,001 ft.

Starr County: W. L. Cotton, Inc., et al 1 Tranquilino Guerra, Porcion 78. Dry. TD 3,016 ft.

Webb County: Gasoline Production Corp. 2 Hughes, Lot 3, Sec. 1526, Benavides Sur., A-2141. Dry. TD 1598 ft.

Charles Katz 1 Marrs McLean estate, Sur. 52. Dry. TD 1,721 ft.

Zapata County: T. R. Cunningham 1 Juana Garza de Uribe, Sur. 249. Dry. TD 4,510 ft.

TEXAS GULF COAST

DeWitt County: Kirkwood & Co. 1 Doehrmann, Patrick Quinn Sur., A-396. IP 5,600 M.c.f. daily, open flow, gas-condensate ratio 25,000 cu. ft. per barrel, 52°, Wilcox 8,234-39 ft. and 8,241-48 ft. (perforations). TD 8,752 ft. (New field.)

Golidad County: Cecil B. Burton 1 William Prewitt est., L. Recindez Sur., A-58. Dry. TD 3,231 ft.

Wrather Petroleum Corp. and McKenzie Drilling Co. 1 Hensley, Goliad Four League Grant. Dry. TD 4,014 ft.

Jackson County: Bright & Schiff 1 Pressley, Peter White Sur., A-83. IP 49 BOPD, 12/64-in., 21°, perforations 2,740-42 ft. TD 2,785 ft. (New pay in Southeast Cordele field.)

Lavaca County: Atlantic Refining Co. Neuhaus, Thomas Bridges Sur., A-80. IP 2,555 M.c.f. daily and 6 BCPD, ¼-in., 51.1°, Wilcox perforations 9,136-40 ft., 9,145-52 ft., 9,170-76 ft., 9,186-9,206 ft., and 9,128-38 ft. TD 10,005 ft. (New field—Chocolate Creek.)

Live Oak County: H. H. Howell et al 1 Brietzke, Block 8, J. S. Stovall Sur. 118, A-429. Dry. TD 6,013 ft.

District 3

Brazoria County: Fourth M. E. Andrews, Ltd., 1 Yelderman, William Robbins Sur., A-123. Dry. TD 7,500 ft.

Chambers County: Sun Oil Co. 1 Jackson-Nolte, I&GN Sur., A-337. IP 45,000 M.c.f. daily, open flow, gas-condensate ratio 86,700 cu. ft. per barrel, 47.2°, lower Frio 8,815-25 ft. (perforations). TD 9,400 ft. (New field—Round Point.)

Fayette County: K. D. Owen and Associated Oil & Gas Co. 1 Frierson, S. St. John Sur., A-296. Dry. TD 5,428 ft.

Fort Bend County: Winebrenner & Tigner 1 McFarlane, H&TC Sur. 102, A-77. Dry. TD 923 ft.

Hardin County: J. P. Owen et al 1 Dolphes McKee Unit 1, H&TC Sur. 184, A-776. Dry. TD 7,675 ft.

Harris County: H. C. Cockburn 1 Carroll, J. H. Callahan Sur., A-10. Dry. TD 7,812 ft.

San Jacinto Petroleum Corp. 1-B Hornberger, B. N. Sessums Sur., A-733. Dry. TD 7,700 ft.

Liberty County: Dan J. Harrison, Jr., 8-A Harrison fee, H&TC Sur. 3, A-227. IP 151.58 BOPD, 11/64-in., 25.6°, perforations 4,304-21 ft. TD 4,702 ft. (New pay in Hankamer field.)

Montgomery County: Simonton & Talley 1 South Texas, T&NO Sur. 9, A-575. Dry. TD 6,828 ft.

Tyler County: D. M. Wallace 1 Crews, S. I. Graham Sur., A-19. Dry. TD 2,183 ft.

Wharton County: Michel T. Halbouty 2 Gary-Hogg, S. F. Austin Sur. IP 103.65 BOPD, 10/64-in., 30°, perforations 3,292-3,310 ft. (New pay in Boling field.)

Johnson & Appling 1 Hutchins & Pearson, W. E. Bell Sur. 32, A-657. Dry. TD 7,250 ft.

EAST TEXAS

Anderson County: Sid Katz Exploration Co. and Holly Development Co. 1 Mrs. J. B. McDonald, S. A. J. Mays Sur. A-504. Dry. TD 5,239 ft.

Increased Service

For the Oil Industry to

Cuba and Venezuela

via Delta-C&S

With the increased activities in the oil industries, the discovery of new oil fields in Cuba, Delta-C&S now offers twice daily service to Havana. Flights leave New Orleans at 9:30 a.m. and 7:30 p.m. Evening Constellation at 7:30 p.m. continues to Caracas.

Through-plane service from the West Coast via Delta-C&S and American Airlines interchange service to New Orleans, fast connection from all points; all coordinated to speed you to booming Cuba and Venezuela.

Fastest—Most direct
from: HOUSTON
DALLAS—NEW ORLEANS
SHREVEPORT
CHICAGO—ST. LOUIS

...the oilman's route!

Delta-C&S AIR LINES

General Offices: Atlanta, Georgia

Ticket offices in: LOS ANGELES, DALLAS, HOUSTON, TULSA, TYLER, KILGORE, SHREVEPORT, NEW ORLEANS, CHICAGO

WILDCAT COMPLETIONS

J. G. Walker et al 1 F. W. and J. C. Huffman, August G. Monroe Sur. Dry. TD 5,110 ft.

Cherokee County: James D. Erwin 1 M. C. Caldwell, Thos. Timmons Sur. A-50. Dry. TD 5,232 ft.

L. A. Grelling 1 Zack Taylor et al, Robt. Stewart Sur. A-760. Dry. TD 4,288 ft.

Harrison County: Douglas E. Proctor 1 W. H. Hinton, Patrick Daugherty Sur. A-5. IP 5,100 M.c.f. of gas per day from lower Pettit, 870 M.c.f. per day from Travis Peak, 6,173-87 and 6,290-98 and 6,332-40 ft., GLR 87.8 MCF-1, GLR 50.1 MCF-1, 65.9° and 55.2°. TD 6,511 ft. (Dual gas discovery).

Hunt County: Peveto & Hager et al 1 Mattis Johnson, James Cole Sur. A-152. Dry. TD 2,990 ft.

Kaufman County: Thos. D. Humphrey & Sons, Ltd., 1 Margaret K. Mallory, 2½ miles E. Walkter Fair field. Dry. TD 5,484 ft.

Limestone County: Westpan Hydrocarbon Co. 1 Crider, W. M. Sanford Sur. A-504. Dry. TD 8,240 ft.

Marion County: The Chicago Corp. 1 T. D. Rowell, Sr. Estate, Jacob Woodruff Sur. A-429. Dry. TD 6,050 ft.

Navarro County: Intex Oil Co. 1 Combs, S. McKay Sur. A-587. Dry. TD 4,062 ft.

Smith County: Wilson Exploration Co. 1 Mary E. Douglas, Joseph Miller Sur. A-714. Dry. TD 4,500 ft.

TEXAS PANHANDLE

Armstrong County: Burdell & Stanotex 1 McGahey, M-9, Sec. 185, J. H. Gibson Sur. Dry. TD 8,504 ft. Strat. test.

Hansford County: United Producing Co. 4 Jackson, 2-19, SA&MG Sur. IP 14,100 M.c.f. of gas per day. TD 7,254 ft. (Geological wildcat).

WEST CENTRAL TEXAS

Brown County: Davis & Davis, Inc. 1 Coppie, V. L. Fields Sur. 36. Dry. TD 1,404 ft.

Trans-Tex Exploration Co. 1 Garmes, Sec. 22, HT&B. IPP 12 BOPD, Caddo lime 1,356-68 ft. TD 1,435 ft. (Oil well).

Callahan County: J. C. Axelson-G. O. Carlson Melvin Dixon-H. O. Polston 1-A Hughes, Sec. 18, D&DA. Dry. TD 900 ft.

The Federal Royalty Co. and Chester Imes 1 Hughes, Sec. 47, D&DA. Dry. TD 2,125 ft.

Jones & Stasney 2-A Snyder, Sec. 139, BBB&C. Dry. TD 2,677 ft.

Mineral & Royalty Co. 1 Ross et al, Sec. 97, BBB&C. Dry. TD 1,680 ft.

Neves Petroleum Development Co. and E. L. Doheny 1-A I. Jackson, Sec. 16, ETRR. IPP 256 BOPD, Hope sand 1,194-99 ft., 38°. GOR 650:1. TD 1,199 ft. (Oil well).

Onyx Oil Co. 4 Dyer, Sec. 13, ETRR. Dry. TD 1,360 ft.

Coleman County: Miller & Banks and A. L. Andree 1-B Wilkinson Est., Sec. 5, GH&H. Dry. TD 2,798 ft.

Comanche County: Toles & Furr et al 1 Kirk, J. H. Rogers. Dry. TD 2,803 ft.

Eastland County: United States Smelting, Refining & Mining Co. 1 Mitcham et al, Sec. 493, SPRR. Dry. TD 4,021 ft.

Haskell County: Jake L. Hamon and Allen Guiberson 1 Hutchins, Arthur Slaydon Sur. Dry. TD 5,918 ft.

King Petroleum Co. and J. R. Less et al 1 McLerman, S. C. Robertson Sur. Dry. TD 3,300 ft.

Jones County: Hack Drilling Co. et al 2

Brown-Snyder, Subd. 6, DeWitt CSL Sur. 150. IPP 86 BOPD, Strawn 4,669-75 ft., 41.2°, GOR 300:1. TD 4,766 ft. (Oil well).

Shackelford County: West Central Drilling Co. and W. F. Fitzgerald 1 Nail Est., Sec. 99, ETRR. Dry. TD 1,543 ft.

Stephens County: H. R. Britton 1 DeLong, SPRR Sur. A-973. IPF 192 BOPD, Marble Falls 4,062-72 ft., 40.4°, ¾-in., GOR 1200:1. TD 4,492 ft. (Oil well).

Capital Co. 1 Harris, Sec. 54-6, T&P. Dry. TD 2,200 ft.

Leatherwood Drilling Co. et al 1 Smith, 14-2, SPRR. Dry. TD 4,660 ft.

Taylor County: Sid Katz and R. H. Venable 1 Dunbar, 42-1, SPRR. Dry. TD 4,940 ft.

Murphy Oil Co. of Okla. et al 1 Newton, 25-18, T&P. Dry. TD 5,316 ft.

Robinson Puckett 1 McCutchen, 115-64, H&TC. IPP 20 BOPD, Fry sand 4,445-49 ft., GOR 150:1. TD 5,143 ft. (Oil well).

NORTH TEXAS

Archer County: M. W. Blair 1-A Cowan-McKinney, Blk. 151, Robert Carson Sur. Dry. TD 1,545 ft.

Consolidated Oil Co. 2 Allison, Sec. 17, Blk. 1, H&TC Sur. A-222. Dry. TD 4,213 ft.

1 J. Roller estate, W. T. Watts Sur. A-1113. Dry. TD 1,526 ft.

Grace & Ford Drilling Co. 1 Atchley, I. Holman Sur. A-162. Dry. TD 1,405 ft.

Lion Oil Co. 1 Williams-Huff, Blk. 28, Lge 2, Denton CSL. Dry. TD 4,843 ft.

Bill Lisle et al 1 Farmer, Blk. 36, L. M. Meade Pasture Subd. W. E. Probert Sur. Dry. TD 1,486 ft.

Ranger Oil & Gas Co. 1 Hayter, TE&L Sur. 2423. Dry. TD 1,510 ft.

1 Ida Tatum, Sec. 18, Meade L. M. Pasture Subd. Dry. TD 1,500 ft.

Harry F. Snebold 1-B Parker, Blk. 1, ATNCL Subd. Dry. TD 1,677 ft.

Baylor County: Humble 4-S W. T. Waggoner Est., 8-B, GH&H. Dry. TD 6,087 ft.

W. A. Loftin and T. V. Gorman et al 1 Macha, 20-1, D&W. Dry. TD 1,625 ft.

Jack C. Staley et al 1 Kolacek, Jr., 25-45, H&TC. Dry. TD 2,668 ft.

Cooke County: A. D. Britton et al 1 Cox, R. Turner Sur. A-1102. IPP 20 BOPD, top pay 3,987 ft., 30°. TD 4,794 ft. (Oil discovery).

A. D. Britton et al 1 Greer, R. Turner Sur. A-1102. IPP 10 BOPD, top pay 2,596 ft., open hole, 39°. TD 2,608 ft. (Oil discovery).

Headwaters Oil Co. 1 McPherson, Robt. J. Scott Sur. A-939. Dry. TD 2,367 ft.

L. W. Powell 5 Cooke, A. Patterson Sur. A-817. IPP 30 BOPD, Strawn pay discovery, top pay 1,120 ft., 39°. TD 1,136 ft. (New pay).

Grayson County: Fred Snuggs and Ed. L. Cox 1 Stephenson, W. G. Miller Sur. A-780. Dry. TD 4,163 ft.

Jack County: Walter L. Plemons Producing Co. 2 Hickman, D. J. E. Clark Sur. A-1943. IPF 360 BOPD, Strawn discovery, 2,876-86 ft., 16/64-in., 40°, GOR 250. TD 2,947 ft. (Oil discovery).

Southern Petroleum Exploration, Inc. 1 Ellison, W. J. Holcomb Sur. A-1844. IPP 121 BOPD, Strawn new pay discovery in Lodge Creek field, 2,813-818 ft., 40°. TD 3,934 ft.

Ward & McCullough 2-B Gillespie, Sec. 2 J. C. and W. F. Thompson Sur. A-2219. IPP 85 BOPD, sand pay discovery in Mercury Strawn field, open hole, top pay 3,518 ft., 42°. TD 3,535 ft.

Warren Petroleum Corp. 11 Jack Fee, Chas. A. Lee Sur. A-1476. IPF 456 BOPD, Caddo lime discovery in Ada Strawn field, 5,712-45 ft., GOR 300, 43.5°, 22/64-in. TD 5,932 ft.

Knox County: Sid Perryman and Oltex Drilling Co. et al 1 Hunt, Blk. 9, J. Garner Sur. Dry. TD 1,678 ft.

Montague County: Lion 1 Hamilton, N. Kimbro Sur. A-405. Dry. TD 6,292 ft.

Wilbarger County: Akin & Dimock 6-A W. T. Waggoner Est., 10-14, H&TC. IPP 46 BOPD, 2,807-810 ft., top pay 2,807 ft., 35°, GOR 100. TD 2,814 ft. (Oil discovery).

Amerada Petroleum Corp. 2 Harrell, 37-15, H&TC. IPP 135 BOPD, lower Canyon pay discovery in Fargo field, 4,171-188 ft., 39.3°. TD 4,235 ft.

Dublin-Kiel 1-N W. T. Waggoner, 18-4, H&TC. IPP 35 BOPD, top pay 2,470 ft., 38°, GOR 300. TD 2,505 ft. (Oil discovery).

Gray Oil Co. et al 1-L W. T. Waggoner Est., 34-14, H&TC. Dry. TD 3,305 ft.

WILDCAT COMPLETIONS

Ted A. Norwood et al 1-K W. T. Waggoner, 11-14, H&TC. Dry. TD 2,864 ft.

Harold Shappell 1-A Waggoner Est., Sec. 27, J. Poitevent Sur. Dry. TD 2,212 ft.

Young County: A. F. Knappenberger 1 Dooley heirs, E. Rhotan Sur. A-243. Dry. TD 3,990 ft.

Louis Pitcock 1 Burgess, C. Smith Sur. A-1634. IPP 42 BOPD, Caddo, open hole, 40°, top pay 3,550 ft. TD 3,600 ft. (Oil discovery).

J. B. Stoddard 1 Stovall, TE&L Sur. 2946. Dry. TD 3,014 ft.

WEST TEXAS

Andrews County: Sinclair Oil & Gas Co. 1 Walker, 20-A-43, PSL. IPF 332 BOPD, ¼-in., GOR 1,475:1, 38.1°, 9,129-54 ft.

DEPENDABLE JENSEN UNITS

are ideal for remote locations

The very fact that JENSEN Pumping Units are simple in design—with few moving parts—makes them ideal for wells located far from service facilities.

Coupled with this is the advantage of rugged construction that assures long life and dependable service. Just in case parts are needed at any time, they are available quickly—and almost any service or adjustment can be handled by one man.

Regardless of the location of your well, there's a JENSEN Unit made to do a better pumping job for less money—and we'll be happy to prove it!

JENSEN

BROS. MFG. CO., INC.

Export Office: 50 Church St., New York City COFFEYVILLE, KANSAS

WILDCAT COMPLETIONS

TD 9,200 ft. (Parker-Penn suggested new field name).

The Texas Co. 1 State of Texas "AU", 22-5, Univ. Lds. IPF 400 BOPD, 20/64-in., 44.3°, Ellenburger 13,800-805 ft., top pay 13,800 ft. TD 13,870 ft. (Suggested field name . . Block 5, Ellenburger).

Schleicher County: L. E. Scherck 1 Judkins, 14-A, GH&SA. Dry. TD 4,905 ft.

Sutton County: Bluebonnet & Panuco Oil Leases, Inc. 2 H. Walker Est., 63-K, GH&SA. Temp. abd. TD 3,037 ft.

Terry County: Midwest Oil Corp. 1 Golden, 17-C-36, PSL. TD 9,535 ft.

Tom Green County: Chambers & Kennedy and Edw. L. Cox 1 Johnson, Jr., 3-24, H&TC. Dry. TD 6,062 ft.

Caroline Hunt Trust Estate 1 Pauline and Elsie Jemeyson, 70, Chas. A. Clark Sur. A-123. Dry. TD 5,973 ft.

Lario Oil & Gas Co. and Anderson-Prichard Oil Corp. 1 Wood, 164, Dist. Blk. 11, SPRR Sur. Dry. TD 4,866 ft.

WEST TEXAS BORDER COUNTIES

Coke County: American Republics Corp. 1-461 Pertiful et al, Sec. 461, Joseph Baker Sur. Dry. TD 4,129 ft.

Kennedy, Chambers, White Eagle and Abtex 1 Greenland, Sec. 2, TTRR Sur. Dry. TD 6,305 ft.

Stanolind 1 Burns "A", 238-2, H&TC. Dry. TD 7-188 ft.

Fisher County: Texkan Oil Co. 1 Fields, 1-K, T&P. Dry. TD 5,712 ft.

Nolan County: Choya Drilling Co., Inc. 1 Dr. J. A. Wimberly, 90-23, 8&P. Dry. TD 7,666 ft.

Ed. Hurley and V. A. Brill 1 Scott, 50-21, T&P. Dry. TD 6,575 ft.

Lion Oil Co. 1 Rogers, 30-1-A, H&TC. Dry. TD 6,158 ft.

The Shamrock Oil & Gas Co. 1 Sanders, 204-1-A, H&TC. Dry. TD 6,280 ft.

Sun Oil Co. 1-A Stone, 27-X, T&P. Dry. TD 7,756 ft.

J. D. Wrather 1 Watts, 203-64, H&TC. IPF 321 BOPD, 18/64-in., 42°, GOR 1157:1, top pay 5,389 ft., perfs. 5,406-12 ft. TD 6,260. (Suggested field name . . Watts Gardner).

Runnels County: Lauderdale & Straughn Drilling Co. 1 Herring, Sec. 120, Washington County School Land. Dry. TD 5,494 ft.

Miami Operating Co., Inc. 2 Lindeman "A", Blk. 262, Austin & Williams Sur. IPF 300 BOPD, 18/64-in., 40°, GOR 250:1, top pay 3,666 ft., perfs. 3,666-69 ft. TD 3,898 ft. (Proposed name . . Miami Lindemann).

Thos. G. Shield 1 Hoffman, R. S. Hamilton Sur. 3. A-999. IPF 430 BOPD, 17/64-in., 45°, GOR 600:1, top pay 2,203 ft., perfs. 2,203-07 ft. TD 3,955 ft. (Oil discovery).

Sojourner Drilling Co., Ltd., 1 Gottschalk, Subd. 20, Ed Conley Sur. Dry. TD 5,205 ft.

SOUTHEAST NEW MEXICO

Lea County: Cactus Drilling Co. 1 Shell State (originally Grover Conrad 1 Shell State), 17-22s-35e. Dry. TD 4,180 ft. dolomite.

INDIANA

Perry County: A. J. Glenn 1 Harding, NW NW NE 12-6s-2w. Dry. TD 224 ft.

KENTUCKY

Daviess County: Felmont Oil Co. 1 O'Brian, SW NW NW 11-O-27. Dry. TD 2,227 ft.

Henderson County: White & Vickery 2 Marshall, SW SE NW 11-P-26. Dry. TD 1,464 ft.

Hopkins County: The Texas Co. 1 Ashby, SW SW NE 4-L-25. Dry. TD 3,270 ft.

Miller and Ashland Oil & Refining Co. 1 Corum, NW SW SW 21-L-26. Dry. TD 2,697 ft.

Webster County: Indiana Farm Bureau 1 Tompkins, NW SW SW 25-M-24. Dry. TD 3,246 ft.

Hoffman and Basin Drilling Co. 1 Pullam, NW SE SE 19-L-20. Dry. TD 2,321 ft.

MICHIGAN

Berrien County: Turner Petroleum Corp. 1 Price, NW NE SW 14-5s-17w. Dry. TD 796 ft. in Traverse lime.

Washtenaw County: Sun Oil Co. 1 Filsinger, NE NE SW 10-4s-5e. Dry. TD 3,432 ft. in Trenton lime.

FLORIDA

Calhoun County: A. R. Temple et al 1 International Paper Co., 16-2s-10w. Dry. TD 4,678 ft. Lower Tuscaloosa 4,448 ft.

Santa Rosa County: Gulf Oil Corp. 9 T. R. Miller Mill Co., Inc., 18-5n-22w. Dry. TD 6,384 ft. Base massive 6,363 ft.

Sinclair Oil & Gas Co. 1 Boland, SE SW 7-1n-27w. Dry. TD 6,948 ft.

MISSISSIPPI

Calhoun County: Honolulu Oil Corp. 1 Davis, 22-12s-1e. Dry. TD 3,325 ft.

Honolulu 2 Davis, 27-12s-1e. Dry. TD 8,385 ft. Knox 8,190 ft.

Hinds County: Larco Drilling Co. 1 McAlpin et al, 19-6n-2w. IPF 748 BOPD, 16/64-

Thompson
VIBRATING
SHALE SHAKER
"Works Like a Charm..."
says McCUTCHEN
DRILLING CO.
"Works like a charm," says McCutchen Drilling Company about the new THOMPSON Vibrating Shale Shaker — a statement that's echoed wherever the new Shale Shaker is in operation. The reason is that this Shale Shaker brings you all the usual THOMPSON advantages and several exclusive and highly useful features such as a SAMPLE MACHINE for quick, accurate sample taking and LIFTING BAILS for easy portability. Investigate the THOMPSON Vibrating Shale Shaker TODAY . . . it will operate efficiently and economically for you on electric, steam, gas engine or oil drive.
FOR COMPLETE DETAILS
WRITE FOR BULLETIN.
SOLD THROUGH SUPPLY STORES — EVERYWHERE
Thompson TOOL CO.
IOWA PARK, TEXAS

4 Styles of INFERNO Pop Valves

Inferno makes a wide variety of 2" Safety Pop Valves:

- Top or side outlet.
- Screw or flange mounting.
- Exposed or enclosed spring.
- Malleable iron body.
- Stainless steel or bronze stems.
- Nickel alloy or bronze valves and seats.
- High grade springs.
- Steam pressure to 350 lbs.
- Oil-water-gas pressure to 1,000 lbs.

Write for Bulletin 11-31.

THE INFERNO CO.
Box 1138A
115 RICOU St.
SHREVEPORT, LA.
INFERNO

OBSERVE this SERVICE

If it can save even a little of your time, this Oil and Gas Journal service should be dear to your heart.

Fill in one of the Time Saver Cards, found on the yellow page, as you read the Journal. When you get to the back cover, you'll have requested more data from Ads and Digest items in which you are interested. Mail the card and in a few days you'll receive the information you need.

Saves Your Time . . .
. . . Helps in Your Work

WILDCAT COMPLETIONS

in., 35.4°, GOR 191:1, perfs. 9,920-40 ft. TD 9,948 ft. (Bolton field discovery well).

Wilkinson County: Serio-Punches-Crow Drilling Co. 1 Ford, 36-2n-2w. Dry. TD 8,703 ft.

SOUTH LOUISIANA

Acadia Parish: Hassie Hunt, trustee, 1 Dommert, 23-8s-1w. Shut-in gas well, no gage, perforations 10,818-28 ft. TD 11,540 ft. (New field.)

Beauregard Parish: Curtis Hankamer 1-A Lutcher-Moore, 26-6s-13w. Dry TD 8,589 ft.

St. James Parish: Union Producing Co. 1 Moseley, 42-13s-16e. IP 249 BOPD, 7/64-in., 37-5°, perforations 10,647-53 ft. TD 11,225 ft. (New pay in College Point-St. James field.)

St. Mary Parish: Shell Oil Co. 1 State Lease 1535, Eugene Island Block 17, Gulf of Mexico. Dry. TD 11,700 ft.

Union Oil Co. of California 1 State Lease 2349, offshore, south 26 minutes and 3 seconds west 6,303.58 ft. from USC&GS Station Plumb 1933. Dry. TD 13,532 ft.

NORTH LOUISIANA

Catahoula Parish: Hunt Oil Co. et al H-99 Louisiana Delta Hardwood Lumber Co., Inc. C SW NE 15-5n-5e. Dry. TD 6,014 ft.

Concordia Parish: Durbin Bond & Co. and Petersen Drilling Co. and Union Producing Co. 1 Turner, 20-8n-10e. IPF 119 BOPD, 9/64-in., Wilcox 5,513½-15 ft., 44°. TD 6,212 ft. (Discovery of Milestone Forks field).

W. L. Billups, Gauthier-& Heard 1 Miller et al, 40-8n-10e. IPF 138 BOPD, 9/64-in., 41°, Artman sand of Wilcox 5,147-49 ft. TD 6,010 ft. (Oil discovery in old Clayton gas field).

E. C. Wantworth and Como Drilling Co. B-1 Angelina Lumber Co., C NE SW 39-3n-7e. Dry. TD 7,562 ft.

LaSalle Parish: Nebo Oil Co., Inc. 13 Nebo Fee, 23-9n-3e. Dry. TD 4,210 ft.

ARKANSAS

Lafayette County: W. A. Sanders 1 Brorn, 10-16s-23w. Dry. TD 2,271 ft.

Miller County: W. & W. Drilling Co. 1 Lowe, 24-15s-23w. Dry. TD 4,308 ft.

Nevada County: Ashland Oil & Refining Co. B-1 Pelt, C NE NE SE 23-14s-23w. Dry. TD 2,165 ft.

Union County: McAlester Fuel Co. A-1 J. A. Rowland Est., 33-17s-14w. Dry. TD 3,761 ft.

Austral Oil Exploration Co., Inc. and Lyons, McCord 1 Hines, C SE NE SE 29-18s-16w. Dry. TD 3,512 ft.

OKLAHOMA

Cleveland County: British-American Oil Producing Co. 1 Gray, SE SE NW 26-8n-1w. Dry. TD 8,135 ft.

Garfield County: Sampson et al 1 Schmitz, NW SE SW 7-21n-3w. Dry. TD 2,500 ft.

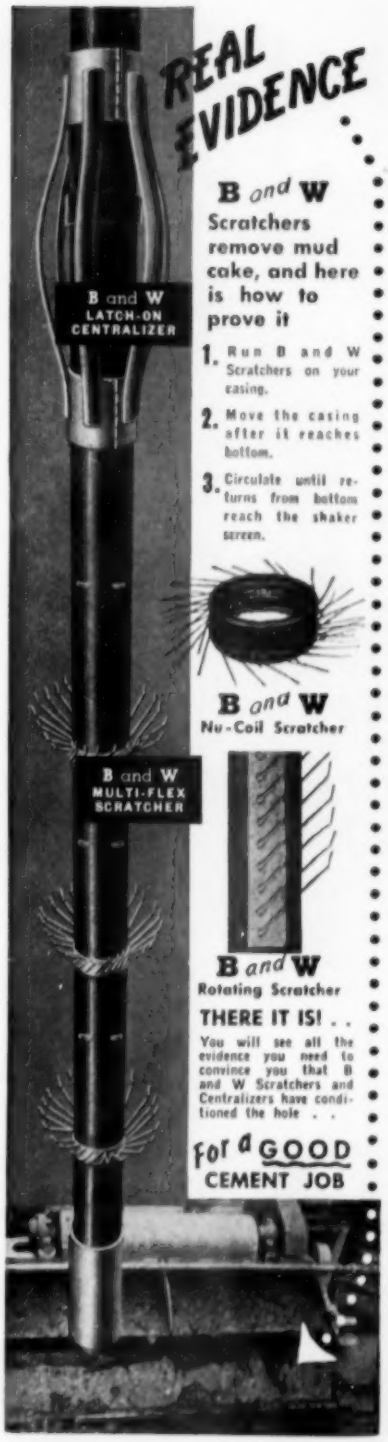
Garvin County: Harry L. Wirick, Jr., et al 1 Carleton heirs, SW SW SE 14-3n-3e. Dry. TD 2,166 ft.

Greer County: Hazeltone 1 Baker, NE SE SE 32-7n-21w. IPP 26 BOPD, 668-90 ft., 39°. TD 690 ft. (Oil discovery).

Hughes County: Gray Drilling Co. 1 Duncan, NW SW SW 14-5n-9e. Dry. TD 1,330 ft.

Jack Robinson 1 Cotton, SE SW SE 14-5n-9e. Dry. TD 857 ft.

Kay County: Carlock 1 Peel, NW NW NW 31-27n-5e. Dry. TD 3,702 ft. Geol. wildcat.



REAL EVIDENCE

B and W Scratchers remove mud cake, and here is how to prove it

1. Run B and W Scratchers on your casing.
2. Move the casing after it reaches bottom.
3. Circulate until returns from bottom reach the shaker screen.

B and W Nu-Coil Scratcher

B and W Rotating Scratcher

THERE IT IS! . .

You will see all the evidence you need to convince you that B and W Scratchers and Centralizers have conditioned the hole . .

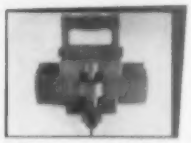
for a GOOD CEMENT JOB

B and W Inc.
Well Completion Specialists

GULF COAST
Box 5266
Houston 12, Texas
Phone WE-6603

WEST COAST
Box 3751
Los Angeles 54, Calif.
Phone ME-4-1106

EQUITABLE
Announces The
NEW
Pneumatic Oscillating
Valve Grinders



Safer — Easier — Air Operated — Weighs only 24 lbs. Designed for the grinding of plug taper valves as used in air brake systems, tank cars, refineries, chemical plants, and also poppet valves used in pumps, air compressors, gas and gasoline engines, etc.

— WRITE FOR DETAILS —

EQUITABLE
EQUIPMENT CO., INC.
410 Camp St. New Orleans 12, La.

WILDCAT COMPLETIONS

Spencer-Royal, Jet Inc., 1 Olsen, NE SW NE 18-29n-5e. Dry. TD 3,160 ft.

Kiowa County: Lee Evans-Basin Oil Co. 1 Stephens, NW NW NW 11-6n-20w. Dry. TD 947 ft.

LeFlore County: Merle Zweifel 1 Workman, SE NW NW 3-2n-24e. Dry. TD 343 ft.

Tone Milton and Standard Seismograph 1 Huffman, NW NE NE 8-2n-24e. Dry. TD 430 ft.

Zweifel 1 Brannon, NW SW NW 34-3n-24e. Dry. TD 200 ft.

Lincoln County: N. V. Duncan 1 Blevins-Young, NE NE SE 10-16n-4e. Dry. TD 4,650 ft.

Pawnee County: Sterling Oil of Oklahoma, Inc. 1 Brown, SE SE NW 18-23n-3e. Dry. TD 4,302 ft.

Pontotoc County: Reinhart & Donovan 1 Hayes Est., SW NW NE 23-2n-4e. Dry. TD 4,302 ft.

Stephens County: King & Sawtelle 1 State, C SW SW 1-2n-9w. Dry. TD 6,820 ft.

KANSAS

Murfin Drilling Co. 1 Palmberg, NE NE NW 22-10s-19w. Dry. TD 3,810 ft.

Russell County: Shelley-Miller 1 Hock, SW SW SE 13-15s-11w. Dry. TD 3,325 ft.

Seward County: Northern Natural 1 Collingwood, C SW SW 4-32s-32w. IP 1,470 M.c.f. of gas per day, regular Hugoton pay. TD 5,025 ft. (Geological wildcat).

Stafford County: Harms-Burt-Manhart-Olson and Cities Service Oil Co. 1 Smith, SW NW NW 14-22s-14w. Dry. TD 3,810 ft.

Lee Phillips 1 Hohner, SW SW SW 31-23s-14w. Dry. TD 4,160 ft.

Sumner County: Helmerich & Payne, Inc. 1 Dietrich, NW NW NE 11-34s-4w. Dry. TD 4,782 ft.

Barton County: J. J. Lynn 1 Schneider, NE NE SE 19-18s-14w. Dry. TD 3,583 ft.

Butler County: Tom Allen et al 1 Redington, SW SW SW 28-26s-4e. Dry. TD 2,865 ft.

Cooperative Refining Co. 1 Lembka, NE NE NE 13-24s-6e. Dry. TD 3,303 ft.

J. P. Gaty 1 James, NE SE NE 5-27s-3e. Dry. TD 3,240 ft.

Cowley County: L. C. Smitherman 1 Drake, NW NW NW 6-31s-5e. Dry. TD 2,980 ft.

Gough Davis 1 Jarvis, NE NE NE 19-32s-8e. Dry. TD 1,870 ft.

Decatur County: H. E. Zoller et al 1 Monaghan, NW NW SE 19-3e-27w. Dry. TD 4,265 ft.

Edwards County: Twin Oil Corp. 1 Bogerd, NE NE NE 10-24s-18w. Dry. TD 4,840 ft.

Pratt County: A. G. Hill 1 Watson, SW SW SE 7-27s-13w. Dry. TD 4,528 ft.

Rawlins County: Ashland Oil & Refining Co. 1 Kacirek, NE SE SW 8-2s-36w. Temp. abd. TD 5,072 ft. Arbuckle 5,007 ft.

Reno County: Schermerhorn 1 Morris, C N½ NE NW 12-25s-10w. IPP 23 BOPD, Mississippian 3,884-3,909 ft. TD 4,347 ft. (Opens Grove pool.)

Stanton County: Huber 1 Sparks, C NE 34-30s-42w. IP 4,300 M.c.f. of gas per day, Morrow 5,254-75 ft. TD 5,554 ft. (Gas discovery.)

Sumner County: Ashton Oil Co. 1 Wolkf, NE NW SE 24-34s-1e. IPP 25 BOPD, Cleveland 3,190-3,203 ft. TD 3,264 ft. (Opens Southwest Ashton pool.)

O. H. Parker 2 Miller, SW NW NW 19-34s-2e. IPP 60 BOPD, Cleveland 3,210-32 ft. TD 3,275 ft. (Opens Ashton field.)

Trego County: Gabbert & Jones 1 Kastner, SW SW NW 6-14s-21w. Dry. TD 4,156 ft.

Sohio Petroleum Co. 1 Stowe, NE NE SW 11-15s-24w. Dry. TD 4,699 ft.

NEBRASKA

Banner County: New World Oil Co. and Halbert & Jennings 1-A Rogers, NW NW SE 3-19n-54w. Dry. TD 5,370 ft. Skull Creek.

Harry Royster 1 Downer, C NE NE 11-18n-56w. IPP 30 BOPD, "J" sand discovery, new field. TD 6,079 ft.

Cheyenne County: Sure Oil Co. 1 Fortner, NW SE NE 31-15n-48w. Dry. TD 4,710 ft.

Kimball County: S. D. Johnson 1 Gross-Wilkerson, SE SE SW 22-14n-58w. Dry. TD 7,176 ft.

Cheyenne County: Braden, Hoover & Kjer 1 Walker, NE NE NE 23-13n-50w. Dry. TD 5,140 ft.

Gem Oil Co. 1 State, SE SE SW 16-13n-49w. Dry. TD 4,907 ft.

Harper-Turner and Dunn & Boreing 1 Mahr, NW NW SW 9-12n-50w. Dry. TD 4,923 ft.

Tuley & Carter 1 Herboldsheimer, SW SW SW 25-14n-53w. Dry. TD 5,610 ft.

Banner County: Genco Oil Co. 1 Mead, NW SE SW 33-20n-55w. Dry. TD 5,548 ft.

Kimball County: New Drilling Co. 1 Johnson, C SW SW 15-15n-53w. Dry. TD 5,685 ft.

Ohio Oil Co. 1 Kenton, NE NE SE 9-14n-54w. IPP 200 BOPD, "J" sand discovery, new field. TD 6,070 ft. Skull Creek.

SOUTH DAKOTA

Corson County: Youngblood & Youngblood 1 Draskovich, SE SE 20-23n-22e. Dry. TD 7,465 ft. Winnipeg.

NORTH DAKOTA

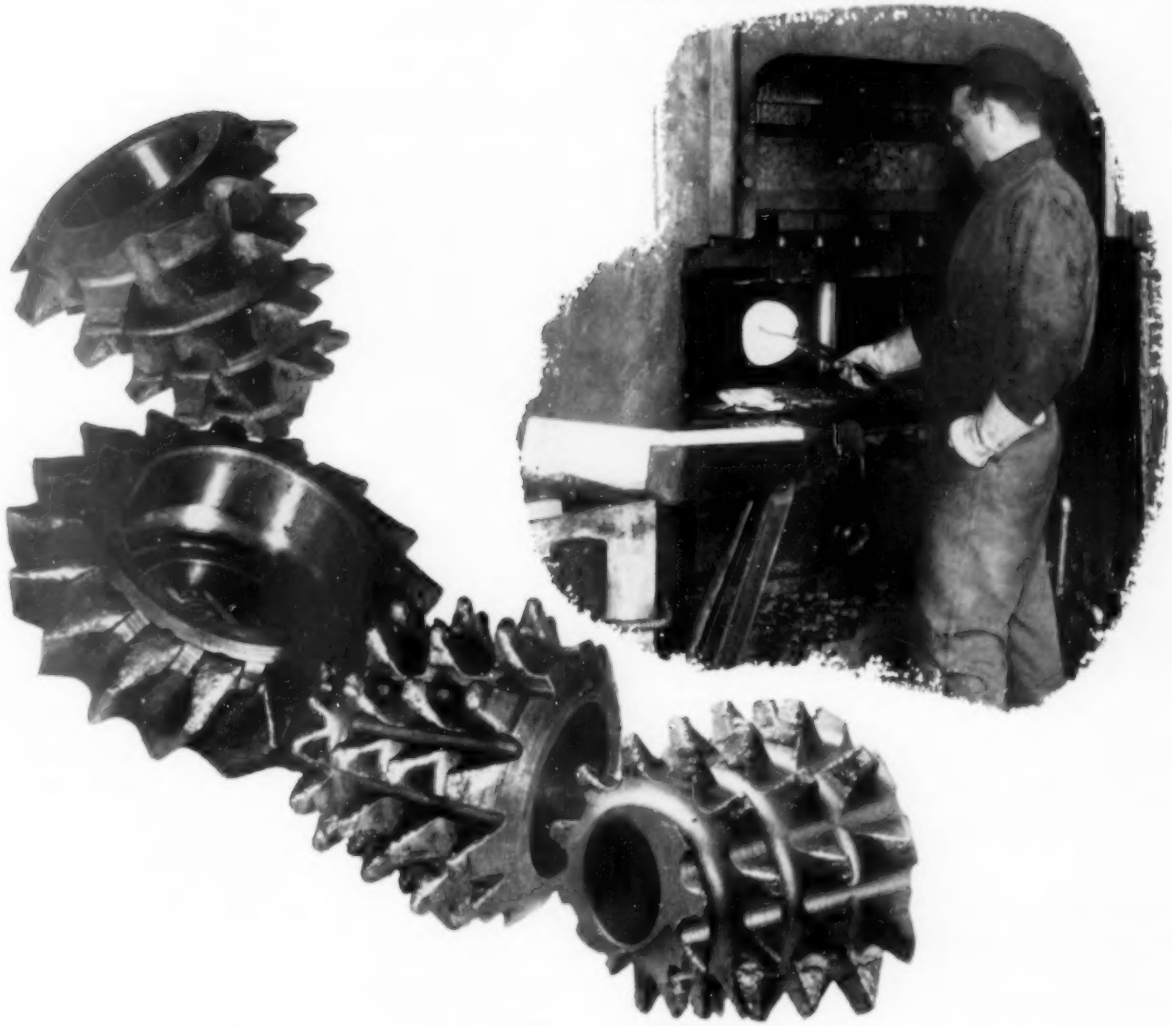
Benson County: Shell Oil Co. 1 Hvinden, NE SE 21-151n-69w. Dry. TD 2,954 ft. Devonian.

*"When the job calls for shaped-charge perforating – **THAT** means **KONESHOT**! (Lane-Wells shaped-charge perforating!)*

All REED ROCK BITS *have*

alloy steel cutters... FORGED

for LONGER SERVICE LIFE



The correct selection of steels . . . the methods used in the manufacturing process and metallurgical "know-how" . . . are the safety factors that give you trouble-free rock bit service life.

REED ROLLER BIT COMPANY

HOUSTON 1, TEXAS

THE MARK OF QUALITY

5170

WILDCAT COMPLETIONS

Benson County, Cranberry Lake: National Bulk Carriers-Smith & Summers 1 Stadum, NW SE 31-154n-70w. Dry. TD 5,144 ft. Graneros.

Shell Oil Co. 1 Murphy-Christensen, NE NW 27-153n-67w. Dry. TD 2,485 ft. Nisku.

Foster County: S. D. Johnson 1 Taylor, SE SW 20-145n-67w. Dry. TD 3,050 ft. Woodbend.

Benson County: Shell J. Spidahl, SE NE 21-152n-69w. Dry. TD 2,970 ft. Devonian.

Foster County: S. D. Johnson 1 Burnham, SE SE 17-145n-66w. Dry. TD 2,780 ft. Souris River.

McIntosh County: Calvert-Exploration 1 Bender, NW NW 19-130n-69w. Dry. TD 3,830 ft. granite.

Stutsman County: Gordon B. Butterfield 1 Trautman, SE SE 5-139n-68w. Dry. TD 4,305 ft. Pre-Cambrian.

CALIFORNIA

Kern County: Superior Oil Co. 7 O.I.C., 30-26s-19e. Dry. TD 3,224 ft.

Wilrich Development Co. 2 C.C.M.O., 30-28s-20e. Dry. TD 1,588 ft.

San Luis Obispo County: E. C. Von Glahn Associates 1 Washburn, 36-32s-20e. Dry. TD 7,201 ft.

Tulare County: K. H. Kruse 1 Well, 27-24s-28e. Dry. TD 502 ft.

Ventura County: J. M. O'Hern 1 McMahan, 29-1n-19w. Dry. TD 6,211 ft.

Yolo County: General Petroleum Corp. 1 Glide-Court, 10-7n-3e. Dry. TD 13,321 ft.

W. W. Holmes, Operator 1 Mohawk-Bemmerly, 10-11n-1w. Dry. TD 3,000 ft.

Fresno County: Artnell Oil & Gas Co. 88-14 L. & W., 14-21s-16e. Dry. TD 9,833 ft.

W. W. Holmes & Assoc. 1 Well, 25-19s-14e. Dry. TD 4,200 ft.

Glenn County: R. S. Rheem, Oper. 1 Packer Island, 6-18n-1w. Dry. TD 6,202 ft.

Kern County: Humble Oil & Refining Co. 1 Humble-Intex-Lerdo Land Co., 4-28s-27e. Dry. TD 8,670 ft.

Union Oil Co. 11-24 Reserve-Hay, 14-11n-19w. Dry. TD 7,688 ft.

Los Angeles County: Union Oil Co. 1 Stern, 12-3s-11w. Dry. TD 8,977 ft.

Santa Barbara County: California Southern Oil Co. 1 Capitan, 33-5n-30w. Dry. TD 2,100 ft.

San Luis Obispo County: Tide Water Associated Oil Co. 1 Montadoro, 3-31s-10e. Dry. TD 6,146 ft.

Tulare County: Maxwell & Assoc. 1 Maxwell, 17-22s-27e. Dry. TD 855 ft.

MONTANA

Big Horn County, Little Crow area: Carter Oil Co. 1 Tribal, NE NE SW 7-1s-53e. Dry. TD 4,675 ft. Tensleep.

Hill County, Hogeland area: Amerada Petroleum Corp. 1 Wade, C NE NE 23-37n-16e. Dry. TD 4,285 ft. Madison.

Liberty County, South Chester area: Amerada 1 Jones, SE SW SW 29-29n-5e. Dry. TD 2,525 ft. Madison.

Richland County, Enid area: Eramont et al 1 NP, C SW NW 21-23n-54e. Dry. TD 11,774 ft. Red River.

Roosevelt County, North Poplar area: J. P. Johnson 1 Blair, C SE NW 16-30n-50e. Dry. TD 8,070 ft. Jefferson.

Glacier County: DeKalb-Northern Oil Div. 1 Ludwig, C SW NE 32-31n-9e. Dry. TD 5,250 ft. Three Forks.

Montana Power 22 Tribal 355, C NW SW 3-36n-7w. Dry. TD 3,947 ft. Madison.

Phillips County, Whitewater Creek: Chicago Corp.-Republic Natural Gas Co. 1 Government-Holly, NE NW SW 2-35n-30e. Dry. TD 4,780 ft. Jefferson.

Powder River County, Whitetail Creek: Murphy Corp. 1 NP, C SW SW 19-2s-47e. Dry. TD 7,190 ft. Morrison.

Roosevelt County, Long Creek area: Sinclair Oil & Gas Co. 1 Iron-Bear, C NW SE 14-30n-49e. Dry. TD 6,870 ft. Mission Canyon.

WYOMING

Carbon County, Sand Flats area: Empire State Oil Co. 1 Government, E½ NE SW 22-25n-89w. Dry. TD 4,710 ft. Dakota.

Fremont County, Southeast Maverick Springs: Cities Service Oil Co. 3 Tribal, NE NE NW 36-6n-2w. Dry. TD 1,663 ft. Tensleep.

Natrona County, Southwest Tisdale: J. Ray McDermott 1 Government, C NE NE 13-40n-82w. Dry. TD 3,403 ft. Tensleep.

Carbon County, North Shirley: Chicago Corp.-Republic Natural Gas Co. 1 Government-Marks, SE NE SE 17-27n-80w. Dry. TD 5,600 ft. Tensleep.

Hot Springs County, NW Thermopolis: Atlantic Refining 1 Government-Davis, NW SE SE 23-44n-96w. Dry. TD 3,283 ft. Tensleep.

Washakie County, Sherard Dome: Farmers Union Central Exchange, Inc. 1 Government-Snyder "D," SW NE SW 24-47n-90w. Dry. TD 4,356 ft. Tensleep.

UTAH

Carbon County, Horse Bench: El Paso Natural Gas Co. 1 Federal, NW NE SW 20-12s-17e. Dry. TD 5,136 ft. Wasatch.

Emery County, Orangeville: Utah Southern 1 State, SW SE SE 25-17s-7e. Dry. TD 4,558 ft. Dakota.

San Juan County: Shell 1 Desert Creek, SW SE NW 2-42s-23e. Dry. TD 6,700 ft. Cambrian.

COLORADO

Jackson County, Coalmont: L. M. Lockhart 1 Government, NE NE NW 11-6n-81w. Dry. TD 7,841 ft. 1st. Morrison.

Logan County: British-American 1 Walter, C SW NW 5-9n-54w. Dry. TD 5,357 ft.

Edens & Yenter 1 Logan County, NW NW NW 29-8n-52w. Dry. TD 4,634 ft.

Halbert & Jennings, New World Oil Co., Fallon Gas Co. 1 Nelson, NW NW NE 26-12n-53w. Dry. TD 5,370 ft.

Morgan County: H. L. Hunt 1 Huey, C SE SE 21-2n-56w. IPP 30 BOPD, "D" sand discovery, new field. TD 5,187 ft.

O'Donnell & Edmonson and Sinclair 1 Mylander, SW SE NE 26-5n-60w. Dry. TD 6,254 ft.

Washington County: Plains Exploration Co. 1 Manitowoc Mortgage Holding Co., SE SE SE 10-4n-53w. Dry. TD 4,944 ft.

Shell Oil Co. 1 Jolly, C NW NW 15-3s-55w. Dry. TD 5,050 ft.

Weld County: O'Donnell & Edmondson and Lion Oil Co., Cortlandt S. Dietler 1 Government, SE SE NE 14-8n-56w. Dry. TD 5,970 ft.

Powder River Oil Co. 1-5 Cox, SW NW NW 5-11n-64w. Dry. TD 5,000 ft. Suspended.

H. C. Arnold 1 Moyer, C SE SE 5-11n-56w. Dry. TD 6,424 ft.

Yuma County: Eastern States Petroleum Co., Inc. et al 1 Maust, SE SE NE 20-3n-48w. Dry. TD 3,955 ft. in Skull Creek.

Delta County: Howard Perry 1 Baker, C NW NW 14-14s-95w. Dry. TD 654 ft.

Logan County: Lee Swedlund and New Drilling Co. 1 Tompkins, NE SE NW 25-8n-55w. Dry. TD 5,252 ft.

Morgan County: J. Taylor and Bruce Sullivan 1 Stephens, NE NE NW 9-3n-58w. Dry. TD 5,860 ft.

B. F. Allison Drilling Co. 1 Beery, NW SW NW 11-4n-56w. Dry. TD 5,407 ft.

British-American 1 Colorado "F," SE NW SE 36-1n-58w. Dry. TD 5,926 ft.

Lion Oil Co. 1 Nagle, SE SE NE 15-1n-58w. Dry. TD 6,210 ft. Morrison.

Washington County: W. R. Edmonson and Love-Miller 1 Brunkhardt, SW SW SE 33-5n-54w. Dry. TD 5,035 ft.

Leon Oliver, Jr. 1 Nichelburg, NW NE SW 2-2n-59w. Dry. TD 4,159 ft.

Shell Oil Co. 1 State, C SW SW 36-2s-55w. Dry. TD 4,953 ft.

Weld County: Sharples Oil Co. 1 Ehrlich, C SE NW 4-4n-64w. Dry. TD 8,760 ft. Lyons.

S. D. Johnson 1 Rohn-Schenck, NE NE NE 13-9n-60w. Dry. TD 7,225 ft.

Rogers Oil Co. 1 Love-McFarlan, C NE NW 4-8n-65w. Dry. TD 9,817 ft. Ingleside.

MANITOBA

Dome-Harris-Cox 7-15 North Tilston, LSD 7, 15-6-29w1. Dry. TD 3,543 ft.

J. P. Owen 1-11-4-29 Brodie, LSD 1, 11-4-29w1. Dry. TD 4,248 ft.

J. P. Owen 12-2 McAuley, LSD 12, 2-15-29w1. Dry. TD 2,221 ft.

SASKATCHEWAN

Phillips-Husky 1 Antelope, LSD 9, 21-32-28w3. Viking gas well. TD 2,894 ft.

British American-Husky-Phillips 2-29 Qu-Appelle, LSD 2, 29-2213w2. Dry. TD 2,641 ft.

Amurex-Canada Southern 1-10 Quest, LSD 10, 21-16-29w3. Dry. TD 4,061 ft.

Socony-Sohio 18-5 Bullkim Lake, LSD 5, 18-3-23w2. Dry. TD 6,455 ft.

Sohio-Canamerican 5-21 Creelman, LSD 5, 21-9-11w2. Dry. TD 4,500 ft.

Socony-Sohio 29-11 East Bethune, LSD 11, 29-20-23w2. Dry. TD 4,685 ft.

Tide Water 4-27 Model Farm, LSD 4, 27-28-13w2. Dry. TD 2,403 ft.

Tide Water 4-19 East Frontier Crown, LSD 4, 19-3-19w3. Dry. TD 4,815 ft.

Tide Water 15-27 Whitemud Crown, LSD 15, 27-5-20w3. Dry. TD 4,800 ft.

Tide Water 11-28 North Shaunavon Crown, LSD 11, 28-9-18w3. Dry. TD 5,011 ft.

Phillips-Husky 1 Lemsford, LSD 8, 10-23-23w3. Dry. TD 3,360 ft.

Imperial 7-31 Viewfair, LSD 7, 31-31-20w3. Dry. TD 2,270 ft.

Midas 3, LSD 14, 28-36-6w3. Dry. TD 5,300 ft.

Hudson's Bay-Canada Southern 2 Denzil, LSD 16, 22-38-26w3. Dry. TD 2,800 ft.

Mid Western 10-15 St. Walburg, LSD 10, 15-54-22w3. Dry. TD 2,108 ft.

ALBERTA

Banff 4-26 Haselwood, LSD 4, 36-46-22w4. Basal quartz gas well. TD 5,729 ft.

Richfield-Banff-Sun 2-29 Crossfield "A," LSD 2, 29-27-28w4. Dry. TD 9,150 ft.

Territories-Charter 2-11 Calvan, LSD 2, 11-36-10w4. Dry. TD 2,954 ft.

Western 12-10 Jenner, LSD 10, 12-22n-9w4. Sunburst oil well. TD 3,359 ft.

Imperial 8-9-44-17 Rosalind, LSD 8, 9-44-17w4. Dry. TD 3,790 ft.

Hudson's Bay-Union 12-27 Liberal, LSD 12, 27-68-21w4. Dry. TD 9,610 ft.

Texaco-Imperial A4-23 Lousi Bull, LSD 4, 23-45-25w4. Dry. TD 5,100 ft.

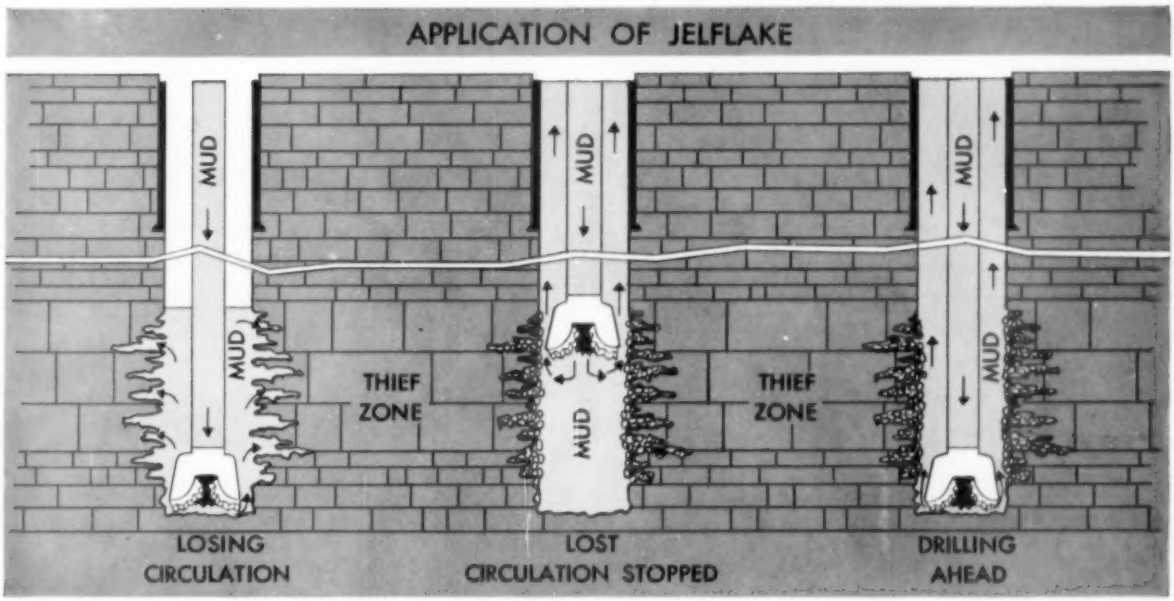
Anglo-Home-C&E South Camrose, LSD 7, 28-46-20w4. Dry. TD 3,325 ft.

Union-Carson 14-31 West Woodbend, LSD 14, 31-51-26w4. Basal quartz gas well. TD 6,193 ft.

Hudson's Bay-Union 15-31 Liberal, LSD 15, 31-68-21w5. D3 oil well. TD 8,583 ft.

RESTORE LOST CIRCULATION TO WELLS AT MINIMUM COST

Use the new, improved Jelflake® for fast, effective mud-loss control at a lower cost-per-job!



When lost circulation is your problem, it's the cost-per-job that counts, not the cost-per-pound of the material you use.

That's why progressive operators prefer to use the new Jelflake—fragmented plastic foil—to regain lost circulation. It is designed for fast, effective stoppage of mud or cement loss to help keep the cost-per-job to a minimum.

Jelflake is made of crinkled plastic particles that are graded in size for positive action. Pin-point sized particles provide deep penetration of thief formations while larger sized pieces plaster themselves into formation openings, sealing off seepage.

Furthermore, new Jelflake requires no special apparatus for application. Just add it to your drilling mud through a hopper or at the mud hog suction.

Keep a supply of new Jelflake handy at all times—it's your best insurance against lost circulation. You can buy it from your nearest mud distributor or Dowell station, packed in convenient 25-pound wet-proof bags. Order your supply today. For further details, write to Dowell in Tulsa, Dept. G-11.

DOWELL SERVICE

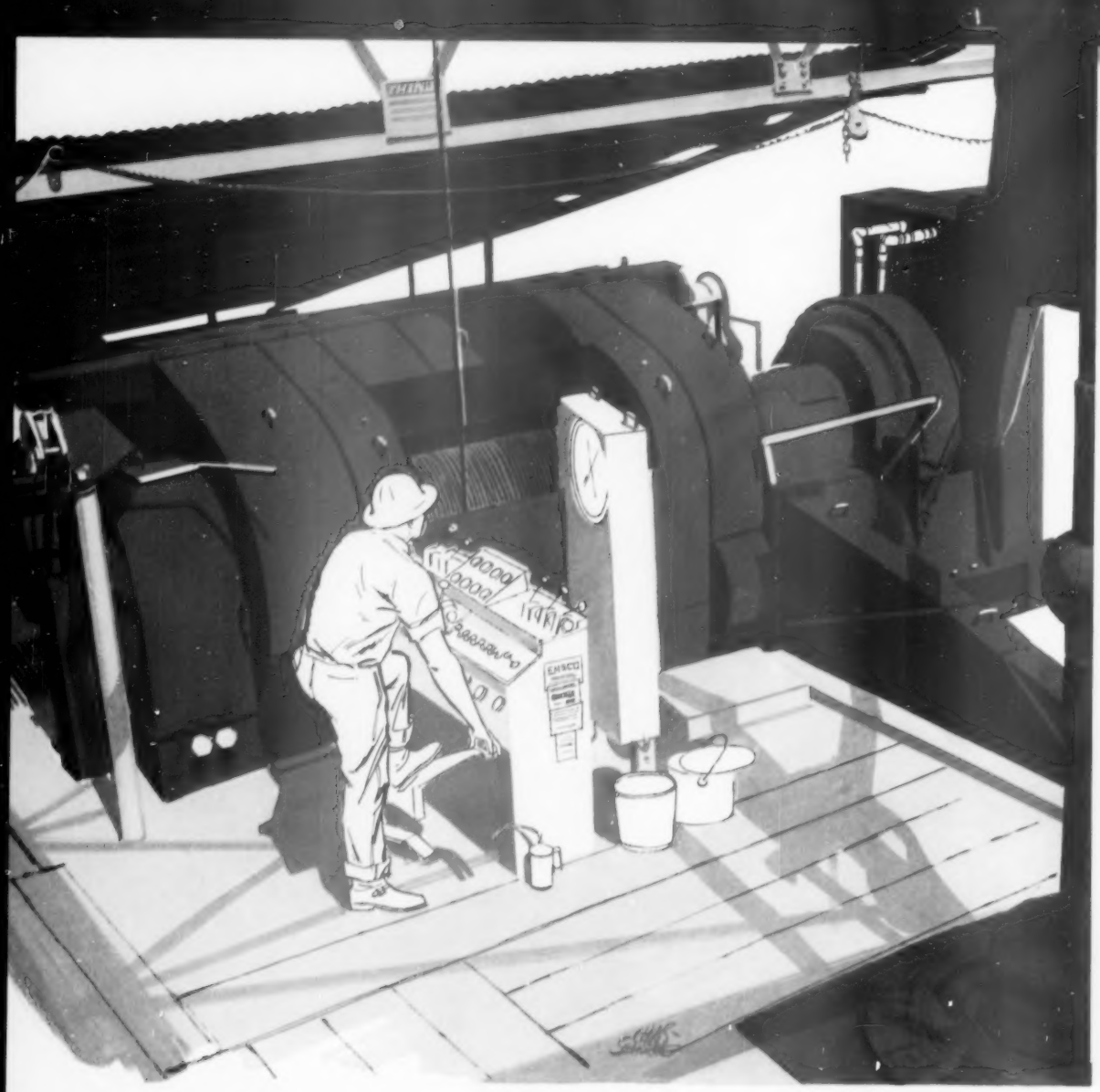
Acidizing • Fracturing • Electric Pilot • Perfojet
Paraffin Solvents • Bulk Inhibited Acid • Jelflake®
Corban® • Chemical Cleaning for Heat Exchange Equipment

DOWELL INCORPORATED · TULSA 1, OKLAHOMA
A Subsidiary of The Dow Chemical Company

"First in Oilfield Acidizing . . . Since 1932"

Look to DOWELL

FOR OIL INDUSTRY CHEMICAL SERVICE



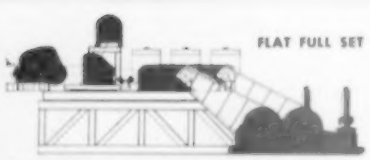
EMSCO'S PACKAGE DESIGN GIVES

"Packaged" design of Emsco's "J" Series Rigs permits a set-up to meet any drilling requirement . . . on land or barge. The flexibility and portability of these big rigs can definitely lower your deep drilling costs.

The key to this versatility is a separate selective speed transmission. By positioning the selective speed transmission at an intermediate elevation between compounding transmission and drawworks, extremely high substructures can be used without making the pump drives excessively long. A level setting may be made if so desired.

Drawworks and compounding transmission are packaged separately and in roadable widths. To separate the packages for transportation it is necessary to break only two chain drives.

For easier operation, controls are located in a separate console at the driller's position. And, where desired, auxiliary equipment may be driven from the compounding transmission.



FLAT FULL SET

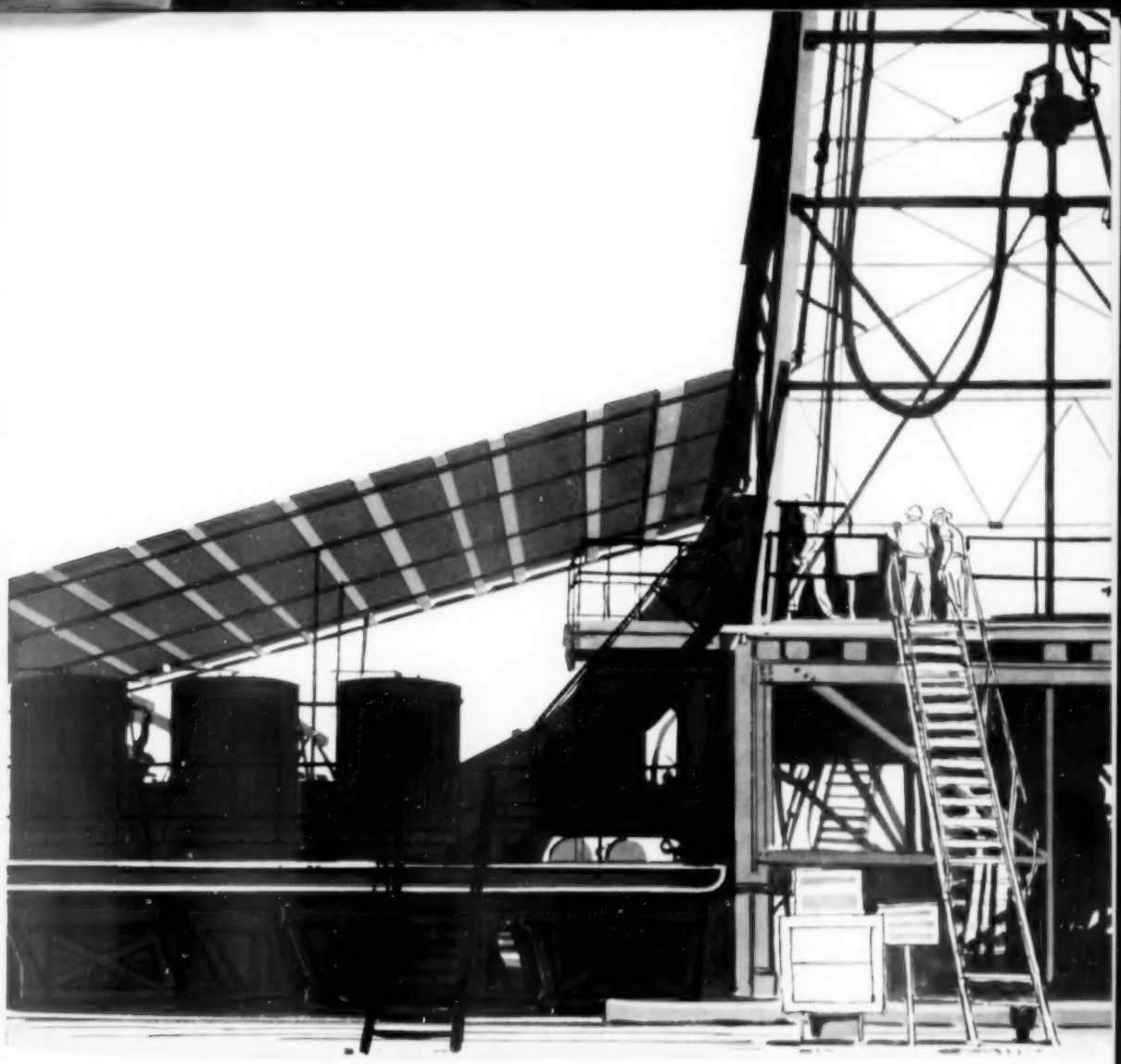
Generally used for offshore barge and piling locations. Drawworks, selective speed transmission and compounding transmission are set at derrick floor level, and optional sand reel on a light sub-base directly above selective speed transmission.

ONE STEP

Drawworks is set at derrick floor level, selective speed transmission and compounding transmission at an intermediate level. Slush pumps are set at ground level with optional sand reel on sub-base above selective transmission.

TWO STEP

Most common arrangement. Compounding transmission and slush pumps are set at ground level, selective speed transmission at an intermediate point, and drawworks at derrick floor level. Optional sand reel is set on sub-base directly above selective speed transmission.



YOU A MORE FLEXIBLE BIG RIG!

You have a choice of 4 drives: mechanical, fluid coupling, electric coupling or torque converter. Pump drives are pedestal-mounted, and clutches are mounted on ends of shafts for easier servicing. All chain drives and shaft bearings are pressure lubricated from built-in oil pumps.

Call CONTINENTAL for details about Emsco's versatile big rigs. Available in three sizes: J-1100, J-1400 and J-2000 for deep to deepest drilling.

EMSCO

EMSCO MANUFACTURING COMPANY
Garland, Tex. LOS ANGELES, CALIF. Houston, Tex.
General Sales Offices: Dallas, Texas

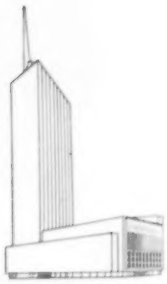
Special setting for deep drilling and where heavy blow-out preventers and 14 to 20-foot substructures are required. Drawworks, selective speed transmission and compounding transmission are set at three levels, the latter on 3 to 7-foot sub-bases. Slush pumps are at ground level.

CONTINENTAL
Serving the Oil and Gas Industries

THE CONTINENTAL SUPPLY COMPANY
General Offices: Dallas, Texas
Representatives in all principal oil fields of the world

E-167

What does it take to build an "Oil Bank"?



EXPERIENCE

Experience that comes from having pioneered oil production loans by commercial banks. Experience that comes from the complete consulting staff of geologists and engineers at your service at Republic.

EXPLORATION

Exploration is the essence of growth in oil production. Financing against production to make exploration possible is a primary activity at Republic. And that's what it takes to make an "Oil Bank".

This is your Republic!

REPUBLIC
NATIONAL BANK of Dallas

CAPITAL AND
SURPLUS $50,000,000
LARGEST
IN THE SOUTH

MEMBER FEDERAL DEPOSIT INSURANCE CORPORATION

ROCKY MOUNTAIN

COLORADO

Morgan and Weld Discoveries Tested

Wildcats in Morgan and Weld counties have apparently opened two new Denver-Julesburg basin pools. J. A. LaFortune, Tulsa independent recovered 1,800 ft. of oil on test of "D" sand at 1 Knight, SE SE NW 34-2n-55w, Morgan County, about 14 miles east of Adena field.

Test was of the interval 4,926-30 ft., with tool open 2 hours. On a previous test of the zone 4,920-30 ft. recovery in 1½ hours was 315 ft. of oil and 350 ft. of fresh water. Flowing pressure on this test was 300-450 psi. Top of "D" sand was found at 4,910 ft. The operator was last reported drilling below 4,950 ft. to test "J" sand prior to completion.

In Weld County, H. C. Arnold and Calvert Drilling Co. recovered 1,600 ft. of oil in 1 hour from 1 King, SE SW NE 13-11n-57w. This test was also of "D" sand in the interval 6,443-73 ft. Shut in pressure was 1,800 psi. The apparent discovery is about 2½ miles west of Battle Canyon field, west of the general trend of production through the northwestern portion of the Denver-Julesburg basin, and in an area which has had comparatively little previous drilling. The operators are coring for "J" sand below 6,520 ft.

Archuleta County Possible Discovery Drilling Ahead

Stanolind Oil & Gas Co. is drilling below 4,155 ft. at 1 Bixler Gas Unit, W½ NE SW 14-32n-6w, Archuleta County after recovery of potentially commercial gas from upper zones. Test of the zone 2,480-2,544 ft. recovered gas at the rate of 425,000 cu. ft. per day. Another test of the interval 2,548-2,602 ft. flowed at the rate of 680,000 cu. ft. per day. A gage of 700,000 cu. ft. per day was obtained on test of the zone 2,450-2,627 ft. The wildcat is southeast of Ignacio field, and north of production in the New Mexico portion of the San Juan basin. It is part of an increasingly active campaign for development and exploration of the Colorado portion of the basin.

WESTERN NEBRASKA

Kimball County Wildcat Tests Oil

Sam Joseph, California independent recovered 1,600 ft. of free oil on 2-hour test of "J" sand at 1 Houtby, SE SE SE 5-1n-54w, Kimball County. Test was of the zone 6,006-10 ft. A core 6,003-48½ ft. included 7½ ft. of saturated sand. Top of "J" sand was called at 5,998 ft. Total recovery included 260 ft. of drilling fluid in addition to the oil.

The well is about 1 mile northwest of Kenton pool, opened by Ohio Oil Co. earlier this year. The discovery well, which produced from "J" sand was completed for a gage of 200 bbls. per day.

WYOMING

Park County Discovery Swabs

Mule Creek Oil Co. of Billings has swabbed at the rate of 470 bbl. of oil per day at 1 Unit, E½ SE SW 16-57n-98w, Tensleep discovery on the Big Polecat unit, Park County. More than 125 ft. of Tensleep sand indicated production on drill-stem tests at the well. Swab tests are of selectively perforated zones from 5,362-5,512 ft. Tests are continuing at the discovery, and the operator has spudded a second well at 2 Unit, NE SW SW 22-57n-98w, about 1 mile to the southeast.

Niobrara County Wildcat Abandoned

Great Basins Petroleum Co. has abandoned 11-12 Government, C NW NW 12-38n-64w, Niobrara County after tests of shows in Lakota failed to produce. Total depth is 7,143 ft. A core 6,854-70 ft. recovered sand with good stain, but drill-stem test recovered only 30 ft. of oil-cut mud. The well is about 6 miles north of Lakota production at Ant Hills, and is well south of Newcastle production along the Clareton trend.

NEVADA

Second Well At Eagle Springs Is Abandoned

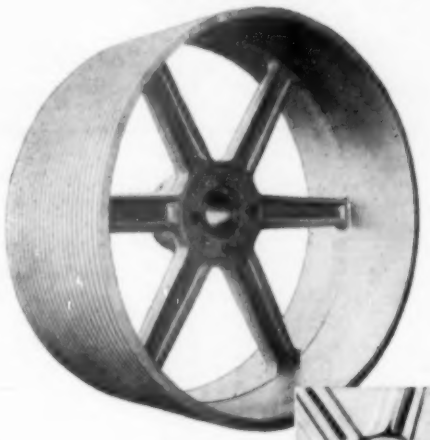
Shell Oil Co. has abandoned the second test of its Eagle Springs unit in Nye County. The first well on the unit became the state's first commercial producer earlier this year.

Total depth of 3 Unit, SW NE NE 27-8n-57e was 6,038 ft. Shell reported no shows of importance, and cut only 19 ft. of core in the wildcat. Location is about 6 miles south

Manufactured In The Oil Field Country

FORT WORTH QD SHEAVE

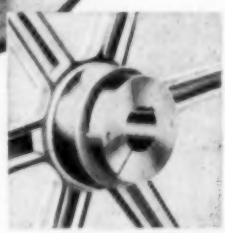
DESIGNED TO GIVE MAXIMUM DEPENDABLE SLUSH PUMP SERVICE



- **PRECISION MACHINED** to give maximum belt life.
- **H-BEAM SPOKES** for less weight and greater strength.
- **MACHINED UNDER GROOVES** to give uniform rim thickness and better balance.
- **THICK OUTER RIM** for winch handling.
- **SPECIAL ANALYSIS** close-grain semi-steel.

TRUE RUNNING

- Accurately machined
- Bores — precision gauged to assure perfect fit of QD split tapered hub in sheave rim.
- Static balanced by specially trained workmen.



EASY ON EASY OFF

With Positive Press Fit

CARRIED IN STOCK

Popular sizes of "QD" Sheaves are stock to provide immediate shipment. Non-stock sizes can be made to order to meet the requirements of the oil industry. Complete stocks of smaller sheaves are carried in QD types.

Fort Worth QD Sheaves are sold by Distributors and supply houses throughout the oil country.

WAREHOUSES: CHICAGO, LOS ANGELES, ST. LOUIS, KANSAS CITY, MEMPHIS, SAN FRANCISCO, NEW YORK, HOUSTON, ATLANTA

FORT WORTH STEEL & MACHINERY CO.

Dept. 278 3600 McCart St., Fort Worth, Texas

ROLLER CHAIN DRIVES, SCREW CONVEYORS and ACCESSORIES, SCREW ELEVATORS, INDUSTRIAL FANS

of the discovery. A third well on this unit is scheduled for early start.

MONTANA

Sumatra Production Is Extended To Northwest

Continental Oil Co. and others reported a swab gage of 20 bbl. of oil per hour at 2-A Kincheloe, C SW SE 8-11n-32e, in the Northwest Sumatra area, Rosebud County. The well is northwest of previous production in the field, with failures intervening between it and the previously productive area. Test was of the zone 4,668-83 ft. and top of Heath was found at 4,671 ft. Location has been made for 3-A Kincheloe, C NW SE 8-11n-32e, and other drilling is planned to the northwest of previous activity by several operators.

NORTH DAKOTA

Benson County Series Continuing

Shell Oil Co. has made location for the tenth well in its current slim hole series in Benson County. The well is 1 Togstad, NW NE 22-153n-69w. The series was announced originally as a probable 5-well program. No shows have been reported by the operator in any of the wells drilled to date through the county.

NEVADA

Shell Oil Co. announced plans for a third well in its exploratory drilling program in Railroad Valley, Nye County, Nevada. Designated 2 Eagle Springs Unit well, the new well will be located approximately 9 miles southwest of the company's discovery well completed last June as Nevada's first oil production.

It is expected drilling equipment will be moved into the new site within the next 2 weeks.

The company's second attempt at well 3 Unit, about 5 miles south of the discovery well, proved unsuccessful and was abandoned at 6,038 ft.

CALIFORNIA

CALIFORNIA

Pipe Set in North La Habra Test

An Orange County wildcat between the Whittier fault trend of fields and the further south Coyote fields may result in a new discovery. At the first of last week water shutoff tests were being made after setting 7-in. casing at 8,150 ft.

The potential discovery is Erin Oil Co. 1 Freedman-North La Habra. Its location is in NE 5-3s-10w, about 1½ miles south of Sansinena field and 2 miles north of West Coyote field. Bottomed at 8,525 ft., it reportedly topped an oil sand at 8,261 ft. and then drilled predominately oil sand to total depth.

New Poso Creek Find Indicated

A new discovery was being indicated by a wildcat 1 mile northwest of Poso Creek field in Kern County. Palomar Oil & Refining Co. 1 Kane-Intex was in process of being completed after 6⅝-in. perforated liner was run to 2,595 ft., depth to which the wildcat had been plugged back after drilling to 2,910 ft. to test Santa Margarita oil possibilities. Perforated interval of the liner was 2,500-95 ft. Location of the potential new pool discovery is in NE NE 30-27s-27e.

Discovery Well to Drill Deeper

The discovery well for Wheeler Ridge field, extreme southeast San Joaquin Valley, is going to be drilled deeper after having been on production almost 32 years. Standard Oil Co. of California 1 K.C.L.-33, in NE 28-11n-20w, will be deepened about 1,000 ft. below the 2,185-ft. depth at which it was completed in November 1922, for a 300-bbl. producer.

Belgian Anticline Outpost

Ohio Oil Co. has staked location for a northwest extension test to Belgian Anticline field southwest of McKittrick. The outpost will be 1 F. E. Smith in 23-30s-21e, almost 1 mile from production. Union Oil Co. abandoned an edge test, 33X-24 Jewett, in Section 24 after drilling to 6,220 ft.

San Clemente Outpost

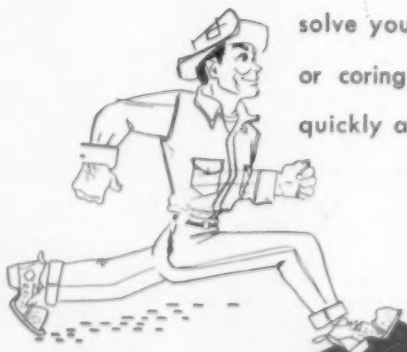
The Texas Co. has staked a ¼-mile southwest extension test to its March discovery near San Clemente, in Orange County and the most southerly oil production in California. The test will be 1 O'Neill estate in 22-8s-7w. The discovery was completed in the interval 3,918-4,185 ft. for 19 bbl. of 45.8°-gravity crude in 48 hours, flowing through a 12/64-in. choke.

"The next time you borrow my chair while I'm gone—Let me know."

What's Doing at D & S?

we're busy giving Service

With a world-wide staff of engineers qualified to help solve your drilling or coring problems quickly and at the least cost.



DRILLING & SERVICE

TRUCO DIAMOND BITS AND D & S CORE BARRELS

Wark is Promoted

Tide Water official sees Ventura wells come and go

THOMAS L. WARK, vice president and new general manager of the western division of Tide Water Associated Oil Co., has been working for the concern, or a predecessor, long enough to see Ventura Avenue wells come and go.

He was a bright, young geologist for Associated Oil Co. there in 1922 when its 5 Lloyd was completed at a depth of 4,051 ft. to establish the field's first sustained, commercial oil producer. He had joined the company 2 years earlier after having obtained a degree in geology at Stanford University.

When 6 Lloyd was completed almost a year later, Wark already had moved on to San Francisco as a valuation engineer for Associated. Since then, however, his "same company, same place" career has been a decided variation from the usual transient life most career oil people follow in moving up the company ladder.

Stays at San Francisco . . . He was still in San Francisco when 5 Lloyd was abandoned a few years ago. Last May when 6 Lloyd was abandoned, after having established a record producing life for Ventura Avenue wells, he was still there and still with Tide Water. By then the company had completed more than 300 wells in the field.

Wark was born in Bruin, Pa., not too many miles from where the founders of the Tide Water portion of the company made their start in 1870. His family moved to California while he was still young and Wark completed his early education at Polytechnic High School in Long Beach.

Moves up . . . With Associated he was a valuation engineer from 1922 until 1929, when he was promoted to geologist. In 1936 when Associated was merged with Tide Water to form the present Tide Water Associated, he again was shifted into the production department. He was made general manager and assistant to the vice president in 1937, and in 1946 became vice president in the production department.

In his new job as division manager he will be in charge of all Tide Water operations in California and the six other western states, and in Hawaii and the Philippines. Charles R. Brown, vice president, is the new assistant general manager of the division.

F. W. Stewart has been named field representative in Oklahoma for Cities Service Oil Co. Stewart previously had served with Cities Service as representative of the crude-oil-supply division at New Orleans.

F. I. Khuri has joined Dow Chemical Co.'s Texas division at Freeport as a design engineer. Other additions by Dow at Freeport include: **H. Senturia,** design engineer; **R. M. Guinn,** and **F. Olstowski,** research and development engineers in the student training program; **C. L. Wheeler,** production development engineer in the student training program, and **M. S. Wing,** chemist in the student training program.

L. Claude Roark has been named geologist in charge of the Tulsa exploration offices for Buffalo Oil Co. Roark, who has served as district geologist for Sinclair Oil & Gas Co. the past 4 years, will be in charge of activities in Oklahoma, Kansas, and active sections of bordering states. **Park G. Ogden, Jr.,** has been appointed to head the firm's exploration offices at Lafayette, La. Ogden, who has been employed since 1948 as an exploration geologist for Stanolind Oil & Gas Co., will be in charge of activities in Louisiana, southern Mississippi, and the Texas Gulf Coast.

R. L. Kretz, consulting geologist at Denver, has been named Rocky Mountain representative for Petroleum Consultants of Houston. Kretz formerly was with J. Ray McDermott.

Ed E. Rue, consultant at Mount Vernon, Ill., has been elected president of Illinois Geological Society. Other officers named are: **Carl F. Pampe,** Pure Oil Co., vice president; **Asa D. McRae,** Magnolia Petroleum Co., secretary-treasurer, and **Jim E. Leward,** Carter Oil Co., past president and chairman of the executive committee.

E. L. Gorham, Jr., has been named manager of joint operations of The Texas Co.'s foreign producing department. Gorham, who joined Texaco in 1935, was formerly assistant manager of the Venezuelan division of Texas Petroleum Co. in Caracas.

Selwyn Eddy has been appointed general manager of Shell Oil Co.'s West Coast division.

Philo C. Wilson has joined the geological staff of Sohio Petroleum Co. at Oklahoma City.

Lorne E. Tjernagel has been transferred by Shell Oil Co. from Bakersfield, Calif., to the geological offices at Oklahoma City. **John P. Cogan** has been transferred by the company from Tulsa to the Oklahoma City engineering staff.

Dr. Peter C. Badgley has been named exploration manager for West Maygill Gas & Oil, Ltd., at Calgary. Badgley had served previously with Husky Oil & Refining, Ltd., as district geologist.

C. L. Morgan has been promoted from Houston division manager to operating superintendent of the Texas distribution division by United Gas Corp.

Allyn C. Miller, former technical operations supervisor of California Research & Development Co., has joined the staff of Stanford Research Institute as an assistant chairman of the chemistry department. Miller formerly was associated with Shell Chemical Corp. as a process design engineer and with E. I. du Pont de Nemours & Co., Inc., as a development engineer at Wilmington, Del.

Joseph A. Thomas has been elected a member of the board of directors of Tide Water Associated Oil Co.

E. V. Corps, formerly exploration manager of Pakistan Petroleum, Ltd., (Burmah Oil Co., Ltd.), has been appointed deputy managing director of

PERSONALS

the company. Corps was development geologist for the company in 1949-50, and visited the United States on a study and lecture tour last year.

Everett W. Pease has joined Sunray Oil Corp.'s California district as chief geologist in the exploration department. Pease served with Sunray as California district geologist from 1949 until 1953 when he started a consulting practice in Bakersfield, Calif.

DR. W. E. KUHN

Dr. Wayne E. Kuhn has been named general manager of the newly created research and technical department of The Texas Co. Kuhn has been manager of the company's technical and research division since September 1938. **James V. C. Malcolmson** has been appointed general manager of the marine

MALCOLMSON

MANGELSDORF

department. Malcolmson, a graduate of Belfast, Ireland, College of Technology, joined Texaco in 1942 in the construction and repair division of the marine department. **Theodore A. Mangelsdorf** has been named general manager of the refining department. Mangelsdorf joined Texaco in 1933 and has been serving as manager of operations division of the refining department.

Robert H. Mansfield has joined Southern California Petroleum Corp. as exploration geophysicist. Mansfield recently returned from Egypt where he had been associated with United Geophysical Co. as senior geophysicist.

C. E. Beecher, Cities Service Oil Co., Bartlesville, Okla., has been elected president of Drilling Research, Inc. Beecher succeeds **C. P. Dimit,** who has resigned due to ill health. Drilling Research was formed to develop new methods and apparatus for drilling oil and gas wells.

R. C. Rice has been transferred from Sohio Petroleum Co.'s pipeline department in Grayville, Ill., to the firm's St. Louis office.

Kenneth Lee Nall has joined Humble Oil & Refining Co. at its Baytown, Tex., refinery as an engineer in the maintenance department. Other Humble additions at Baytown are: **Richard T. Moravek,** research and development division; **David F. Griffin, Don R. Moore, Donald A. Foster, W. Kenneth Brinkley,** and **Hollie L. Briscoe** all in technical service division. **J. J. Samuels** has returned to technical service division after serving with the U. S. Army.

Claude Holcomb has been appointed head geologist in Creole Petroleum Corp.'s Western Division at Maracaibo, and **Harry Borger** has been named assistant head geologist of the division. **John Peterson** has been appointed district geologist at Tia Juana, succeeding Borger. Other recent Creole personnel changes: **Joe Johnson,** transferred from Eastern Division to Lagunillas as district geologist; **K. R. Smith,** appointed supervisor of the statistics section of the economics department in Caracas, transferred from the materials department; **W. Y. Brown,** named district superintendent in San Joaquin; **J. F. Moore, Jr.,** appointed assistant district superintendent in Quiriquire effective November 15; **G. A. White,** appointed district superintendent in Lagunillas effective November 15; **C. H. Alexander,** appointed San Joaquin drilling engineer; and **T. V. Dellinger,** transferred from San Joaquin to Tia Juana as drilling engineer.

Everett A. Jenkins has been named production vice president by Three States Natural Gas Co., Dallas. Jenkins had been acting vice president before his promotion. Before joining Three States, he had served as general production superintendent for Skelly Oil Co. **Harold S. Bowman,** formerly with Gulf Oil Corp. in Venezuela, was named vice president in charge of the land department by Three States.

Edwin Van den Bark has been named district manager of Phillips Petroleum Co.'s district office at Midland, Tex., for West Texas and southeastern New Mexico. Van den Bark, who has been with Phillips since 1939, has been district geologist at Midland since 1949. **Fred Ferward,** district landman for Phillips at Midland for 2 years, is being transferred to Jackson, Miss., as district manager for the land and geological department there. **Albert M. Schiemenz** has been named district geologist at Midland succeeding Van den Bark. The changes are effective September 1.

Howard L. Yowell, head of motor-lubricants and wax section of Esso Laboratories of Standard Oil Development Co., has been assigned to Esso's European laboratories in Abingdon, England. Yowell will succeed **Donald H. McLean,** who will take Yowell's position in the Esso exchange system.

W. O. Allen has been named manager of the San Antonio district of United Gas Pipe Line Co. Allen, who began his career with a predecessor company of United's in 1923, succeeds **W. W. Clopton,** who has retired.

George T. Atkins has been promoted to engineering associate by Humble Oil & Refining Co. at its Baytown, Tex., refinery. Atkins will be concerned with development of design criteria and with the actual design of projects being considered for the refinery.

D. E. Lewis has been named division solicitor for Imperial Oil, Ltd., western producing division. Lewis succeeds **G. W. Robinette,** who has been transferred to the company's executive office in Toronto.

William W. Mayfield has been elected a vice president of Hope Natural Gas Co., Clarksburg, W. Va. Mayfield, who joined the firm in 1934 as a mechanical engineer, has been serving recently as manager of Consolidated Gas Supplies.

Frederick Larsen has joined Dominion Oil, Ltd., as drilling representative at Port of Spain, Trinidad. Larsen formerly was lead engineer with The California Co., at Rangely, Colo.

M. J. Rathbone, president of Standard Oil Co. (N. J.), has been elected to the 144-man board of trustees of the Committee for Economic Development, a national nonprofit economic research and education organization.

J. A. Golasinski has been promoted to superintendent of operations in the Houston area gas department for Shell Oil Co. Golasinski had been serving with Shell as superintendent of the Sheridan, Tex., gas district. **R. J. Thorsen** has been named assistant superintendent of the Sheridan plant.

PERSONALS

Ed Lucas has joined the land and geological staff of Turner Petroleum Corp., Mount Pleasant, Mich. A past president of Michigan Oil and Gas Scouting Association, he had been serving as a geologist with Roosevelt Oil & Refining Corp., Mount Pleasant.

F. Saravia, formerly administrative assistant director of petroleum for the Peruvian Government, has been appointed director. He succeeds **Fernando Noriega Calmet** who had held the position since the new Peruvian petroleum law was passed in 1952. Noriega Calmet will continue as general manager of the Peruvian Government company, Empresa Petrolera Fiscal. **David Torres Vargas** has been appointed assistant director succeeding Saravia. **O. Quiroga** continues as assistant director in charge of technical matters.

G. A. WILSON

W. L. KYGAR

George A. Wilson, president of Interstate Oil Pipe Line Co., has been elected president of Yellowstone Pipe Line Co. **W. L. Kygar,** president of Continental Pipe Line Co., has been elected vice president and general manager. Other officers are: **John D. Morrow,** Continental, secretary; **R. L. Bosworth,** Continental, treasurer, and **P. H. Hunter,** Interstate, assistant secretary-treasurer. Directors of Yellowstone, elected recently at a meeting of stockholders, include: Wilson; Kygar; **Joseph L. Seger,** Carter Oil Co., **Thomas Brownfield,** Carter; **W. Turner Clack,** H. Earl Clack Co.; **E. L. Hiatt,** Union Oil Co. of California; **J. W. Liddell,** Continental, and **T. A. van Griethuysen,** Continental.

K. T. McCamman, formerly district production superintendent for Shell Oil Co. at Ventura, Calif., has been promoted to division production superintendent there. **W. K. Lupton,** formerly district production foreman, has taken on McCamman's former duties. **W. E. Rehm** was promoted to Ventura production foreman. **C. E. Taylor,** formerly in the Los Angeles area offices, is now stationed at Ventura as a mechanical engineer. **G. E. Pfenning,** formerly a mechanical engineer in the Long Beach division offices, has been transferred to Ventura as drilling foreman. Three other changes in Shell's California production department are: **W. A. Faulk,** shifted from mechanical engineer at Long Beach to production foreman at Brea; **J. F. Richards,** moved from Los Angeles to Long Beach as a mechanical engineer, and **D. K. Murray,** moved from Los Angeles to Salt Lake City as a development engineer.

Frank N. Scott has been transferred by Bechtel Corp. from the industrial division of the Los Angeles office to San Francisco where he will be engineering assistant to **John M. Rogers,** senior vice president.

Frank F. Painter, former geologist with Carter Oil Co. in Tulsa, has resigned to join Creole Petroleum Corp. at Caracas, Venezuela.

R. A. Roberds has been promoted to lead petroleum engineer by The California Co. at Rangely, Colo. Roberds succeeds **Fred Larsen,** who was transferred to Trinidad.

R. L. Gibson has been named manager of the East Texas division, production department, of Shell Oil Co. replacing **A. T. Rylands,** who has been named head of the Calgary division's production department. Gibson formerly was chief exploitation engineer at Shell's Houston office. He will continue to headquarter in Houston.

Bruce Scrafford has been elected president of Highland Oil Co. Scrafford, who had been serving as vice president of the company, succeeded **Virgil A. Brill,** who resigned. **Robert D. Hendrickson,** former chief geologist with the company, has been appointed vice president.

R. E. Triffett has been named director of marketing for Champlin Refining Co., a subsidiary of Chicago Corp.

E. H. Smith has been named superintendent of Lyons pipeline district, Lyons, Kans., by Cities Service Gas Co. Other changes announced by the company include: **Don Lamont** named superintendent of the Corwin, Kans., compressor station, and **E. A. Komma** appointed superintendent of Tonganoxie, Kans., compressor station.

Max L. Riley has been elected director, vice president, and general manager of Southwest Gas Producing Co., Inc. Riley had been serving as chief engineer. **P. B. Snodgrass,** treasurer of the company, has been elected to the board of directors. **Richard F. Cox,** former district engineer at the DuBach, La., office has been named chief engineer to succeed Riley. **Alfred E. Beasley,** former head of the land department at Monroe, La., has been appointed land and exploration manager in charge of the district office at Lafayette, La.

DEATHS

H. H. Fuller, 68, retired vice president of Sinclair Refining Co., died August 8 at La Gorce Island, Miami Beach, Fla. Fuller, who started in the oil business in 1905, joined Sinclair in 1919 and served as manager of bulk sales before being appointed vice president in charge of wholesale business in 1928.

S. N. Van Wert, former Bartlesville, Okla., oil man, died August 10 in Dallas.

N. V. (Nick) Duncan, of Fairfield, Ill., veteran operator with holdings in Oklahoma, Texas, and Illinois died recently in a Chicago hospital.

John W. Myers, independent operator of Olney, Ill., died recently at Delavan, Wis.

John A. Bates, 66, veteran of 34 years in the production department of Gulf Oil Corp., died August 8 in Sapulpa, Okla.

Merle J. Trees, 71, chairman of the board of Chicago Bridge & Iron Co., died August 6 in Chicago. Trees started with Chicago Bridge in 1910 as an estimator and contractor and was made chairman of the board in 1945.

James D. Long, 83, former superintendent for Republic Production Co. and later The Texas Co., died recently in Dallas. He was an independent oil operator in Ohio, Indiana, and Illinois before moving to Texas.

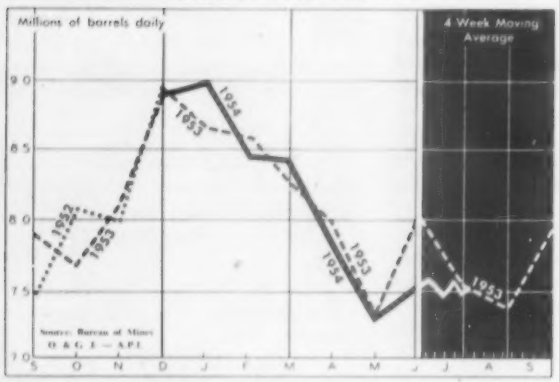
H. A. Swem, vice president and general manager of Texas Gulf Sulphur Co., died in Newgulf, Tex., August 8. He had been with the company in an engineering capacity since 1919.

Latest Figures . . . Industry Trends

A QUICK LOOK AT THE HIGHLIGHTS

	LATEST WEEK	Change from WEEK AGO		Change from YEAR AGO	
Production	6,163,975	DOWN	55,000	DOWN	415,772
Crude stocks	279,744,000	DOWN	141,000	UP	600,000
Completions	1,067	UP	27	UP	18
Refinery runs	6,744,000	DOWN	83,000	DOWN	319,000
Gasoline stocks	156,808,000	DOWN	1,594,000	UP	15,329,000
Four-product stocks	349,662,000	UP	4,802,000	UP	21,015,000
Total imports	999,500	UP	133,700	UP	119,300

TOTAL DEMAND – ALL OILS



Distillate Markets Strenghten as Jobbers Start Filling Storage

ESSO STANDARD OIL CO. announced the withdrawal of the voluntary allowance from posted prices for No. 2 fuel in its marketing territory north of Baltimore, effective at the beginning of the second week in August.

This discount, which amounted to 0.25 cent a gallon, had been in effect since last June. At that time, price guaranties had been announced protecting the buyer against loss due to lower prices during the summer months, but very few sales were reported.

The return to nearer normal markets was indicated by increased movement of heating oils out of the Gulf Coast district and higher cargo prices. No. 2 fuel moved up 0.25 cent a gallon on the Gulf Coast during the last week of July. Cool weather in areas of the North Central district brought an increase in the number of inquiries for heating oils in the Mid-Continent.

Distillate stock position . . . Higher prices, discontinued discounts, and cooler weather in some areas caused some secondary suppliers to take a look at the potential supply for the winter. Distillate stocks at the end of July were almost 2,000,000 bbl. less than at the same time last year, and kerosine stocks were up only 1,000,000 bbl.

Another important factor in the supply potential for the winter is the need for reduced refinery runs in order to cut gasoline stocks. Gasoline stocks at the end of July amounted to about 158,000,000 bbl. A desirable stock level for the end of September or the middle of October would be about 130,000,000 bbl., and failure to reduce inventories at least below 140,000,000 bbl. could present a problem in winter gasoline storage.

Higher distillate yields . . . The forced reduction in gasoline inventories probably will be accomplished by cuts in both refinery runs and gasoline yields. Lower yields of gasoline will mean higher yields of heating oils, but a price incentive is needed to help promote the shift.

Heavy cuts in gasoline prices, particularly on the Gulf Coast, had reduced the gap between gasoline and heating oils. The shrinking differential tended to promote the production of distillates.

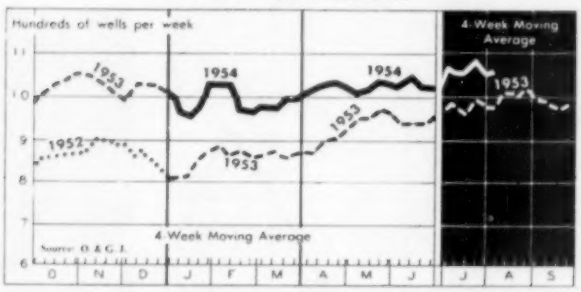
The reverse was true with the recent increases in cargo gasoline prices on the Gulf Coast. Better prices for No. 2 fuel are needed to promote the production of this product.

Distribution of distillate stocks . . . Districts 2 and 4 had more distillate stocks at the end of July than at the same time last year, but the gains in these districts were more than offset by heavy reductions in District 3.

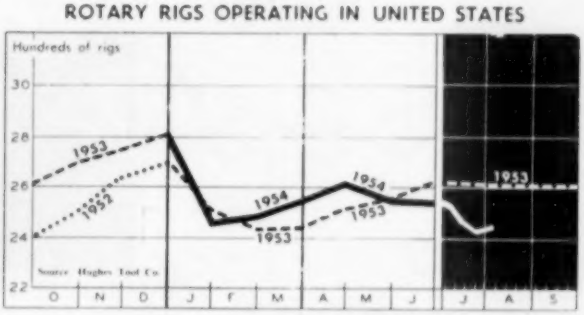
Distillate stocks in District 3 were 5,437,000 bbl. less than a year ago while District 2 stocks were up 3,866,000 bbl. Despite the increase in District 2, some suppliers believe that demand will be high enough to support a firm heating-oil market this winter.

Movement of gasoline out of the Mid-Continent has been very good since the first of August, but the heavy stock surplus has prevented any price increase in regular gasoline. Premium grade is in better position with prices slightly firmer.

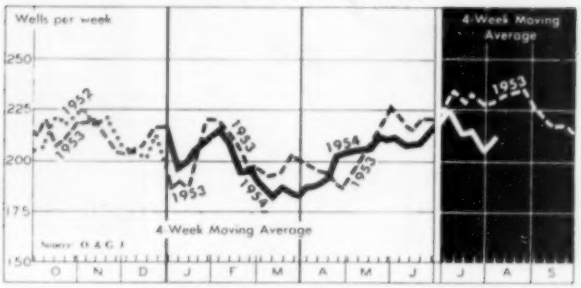
TOTAL COMPLETIONS



ROTARY RIGS OPERATING IN UNITED STATES



WILDCAT COMPLETIONS



ACTIVE ROTARY RIGS

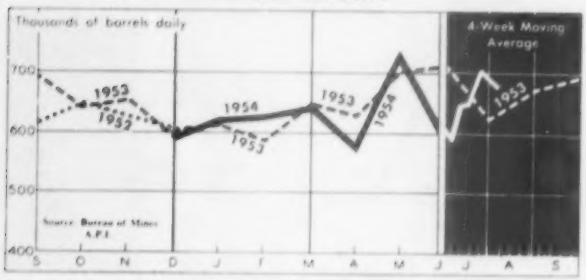
Area—	8-9-54	Change from 8-2-54	Change from 8-10-53
Gulf Coast	536	—10	— 34
N. and W. Texas-New Mexico	769	— 3	— 27
Arkansas-N. Louisiana-E. Texas	163	8	13
Oklahoma	328	18	— 38
Kansas-S. Nebraska	168	11	9
Illinois-Eastern	114	— 1	— 38
Rocky Mountain	255	— 8	— 18
Pacific Coast	120	...	— 50
Total United States	2,453	15	—183
Western Canada	157	—21	— 23

WEEKLY WELL COMPLETIONS . . . WEEK ENDED AUGUST 7, 1954

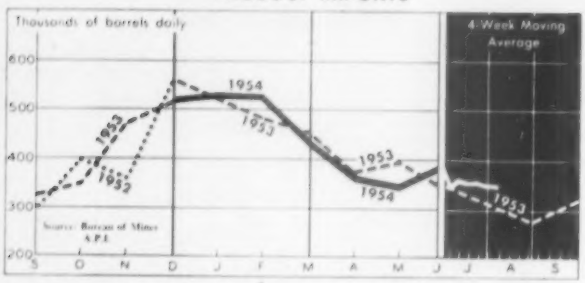
	Total of all wells: Comp.	Oil	Gas	Dry	Footage	Cum. 1954	Cum. 1953	Wildcat completions and discoveries: Oil	Dist.	Gas	Dry	Total	Cumulative total, 1954: Oil	Dist.	Gas	Dry	Total
Ala.-Ga.-Fla.	3	0	0	3	18,010	69	83	0	0	0	3	3	2	0	2	59	63
Arkansas	9	3	0	6	31,616	383	300	0	0	0	5	5	17	0	4	70	91
California	36	20	0	*16	173,962	1,459	1,558	0	0	0	9	9	40	1	8	312	361
Colorado	26	8	2	16	147,570	796	385	0	0	0	12	12	23	0	10	303	336
Illinois	57	38	0	19	146,437	1,686	1,115	0	0	0	0	0	6	0	0	223	229
Indiana	13	6	0	7	17,869	463	755	0	0	0	1	1	5	0	0	87	92
Kansas	87	44	4	39	305,423	2,715	2,962	3	0	1	12	16	49	0	12	361	422
Kentucky	26	8	3	15	55,670	680	639	0	0	0	8	8	11	0	3	71	85
Louisiana	49	37	1	11	220,694	2,049	1,551	3	1	0	5	9	67	39	22	194	322
North	37	32	1	4	94,775	1,121	638	2	0	0	2	4	10	3	7	77	97
South	12	5	0	7	125,919	928	913	1	1	0	3	5	57	36	15	117	225
Michigan	13	6	1	6	44,007	335	348	0	0	0	2	2	11	0	0	134	145
Mississippi	12	6	0	6	89,155	245	226	1	0	0	3	4	6	0	0	87	93
Montana	15	7	1	7	60,315	190	240	0	0	0	5	5	3	0	1	55	59
Nebraska	13	3	1	9	68,497	220	204	1	0	0	6	7	14	0	3	71	88
New Mexico	22	11	9	2	107,466	664	834	0	0	0	1	1	12	0	12	69	93
North Dakota	7	3	0	4	38,780	169	153	0	0	0	4	4	4	0	0	60	64
Ohio	24	11	6	7	46,132	695	624	0	0	0	0	0	3	0	4	9	16
Oklahoma	180	110	5	165	607,709	5,648	4,430	1	0	0	15	16	71	3	18	388	480
Pennsylvania-New York	41	20	10	11	87,756	1,437	1,476	0	0	0	2	2	0	0	5	25	30
Texas	384	223	24	137	1,669,593	11,109	10,425	24	4	3	92	123	489	50	96	2,526	3,161
Southwest (1 & 4)	54	28	5	21	233,649	1,570	1,691	0	1	1	15	17	72	23	26	430	551
Gulf Coast (2 & 3)	44	20	2	22	242,163	1,625	1,540	3	3	0	12	18	53	22	29	404	508
East (5 & 6)	21	5	4	12	103,388	587	493	0	0	1	10	11	8	0	9	173	190
North Central (7-B & 9)	156	87	1	68	520,483	4,168	3,949	17	0	0	43	60	218	4	12	1,035	1,269
West (7-C & 8)	88	73	2	13	502,116	2,583	2,271	4	0	0	11	15	136	0	14	431	581
Panhandle (10)	21	10	10	1	67,794	576	481	0	0	1	1	2	2	1	6	53	62
Utah	9	0	0	9	26,314	45	46	0	0	0	3	3	3	0	1	23	27
West Virginia	19	0	13	6	54,418	342	365	0	0	1	1	2	0	0	18	10	28
Wyoming	22	15	0	7	127,267	816	411	0	0	0	3	3	27	0	4	115	146
Miscellaneous	0	0	0	0	0	84	38	0	0	0	0	0	2	0	0	16	18
Total United States	**1,067**	579	80	408	4,144,660	32,299	29,168	33	5	5	192	**235**	865	93	223	5,268	6,449
Total previous week	1,040	566	81	393	4,252,117			23	3	8	175	209	832	88	218	5,076	6,214
Total August 8, 1953	1,049	545	83	421	4,187,103			30	4	12	186	232	875	69	234	5,443	6,621

Service wells included: *1, 19.

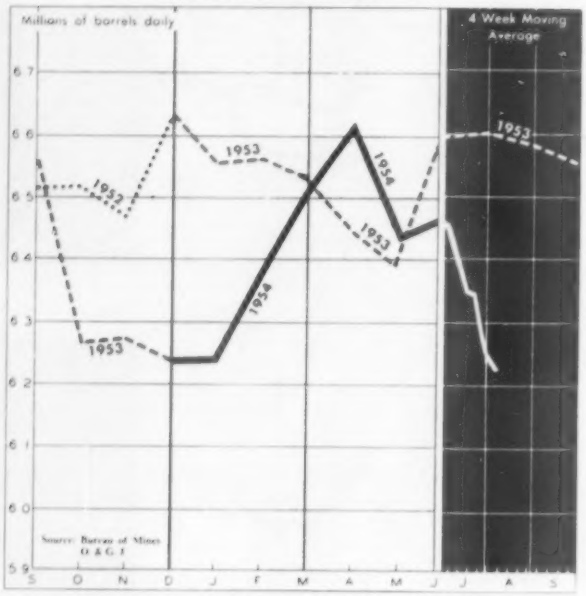
CRUDE IMPORTS



PRODUCT IMPORTS



CRUDE-OIL PRODUCTION

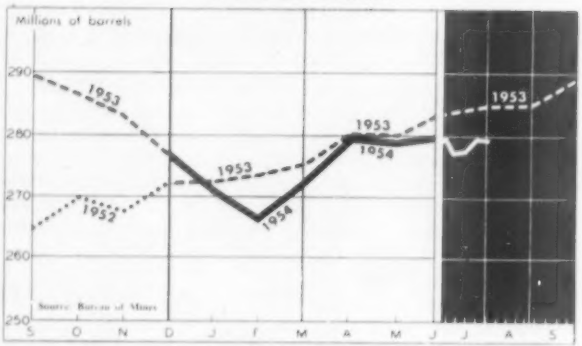


DAILY AVERAGE PRODUCTION FOR WEEK

	August 7 — Crude oil	Lease condensate	Total	July 31 total
Alabama	4,400		4,400	4,200
Arkansas	74,850	500	75,350	76,300
California	975,200		975,200	978,800
Colorado	132,700		132,700	130,600
Eastern	55,100		55,100	55,100
Florida	1,500		1,500	1,625
Illinois	177,300		177,300	179,900
Indiana	28,200		28,200	28,400
Kansas	332,200		332,200	331,100
Kentucky	35,500		35,500	35,800
Louisiana	606,175	38,200	644,375	661,000
North	108,450	3,050	111,500	110,500
South	497,725	35,150	532,875	550,500
Michigan	33,900		33,900	31,700
Mississippi	87,400	3,100	90,500	90,200
Montana	37,600		37,600	36,900
Nebraska	19,100		19,100	19,500
New Mexico	206,675	1,650	208,325	204,375
Oklahoma	485,100		485,100	470,600
Texas	2,517,275	44,650	2,561,925	2,618,500
Dist. 1	41,175	350	41,525	41,350
Dist. 2	124,275	5,550	129,825	135,750
Dist. 3	402,000	22,200	424,200	437,100
Dist. 4	221,750	5,200	226,950	237,500
Dist. 5	42,075	250	42,325	42,850
Dist. 6	105,425	4,600	110,025	112,700
East Texas field	206,850		206,850	218,000
Dist. 7-B	124,150	25	124,175	119,025
Dist. 7-C	170,425	4,500	174,925	177,300
Dist. 8	817,000	1,800	818,800	836,700
Dist. 9	178,850	150	179,000	178,200
Dist. 10	83,300	25	83,325	82,025
Utah	4,800		4,800	5,000
Wyoming	246,100		246,100	244,600
North Dakota	‡14,800		‡14,800	14,500
Total U. S.	6,075,875	88,100	**6,163,975**	6,218,700
Change from previous week, down			**54,725**	
Canada	†249,775		†249,775	†301,550
Total U. S. production January 1-August 7			1,401,117,750 bbl.	
Same period last year (crude plus cond.)			*1,429,584,236 bbl.	

*Includes 20,140,150 bbl. condensate. †Week ended previous Monday. ‡Includes S. D. 100.

CRUDE-OIL STOCKS



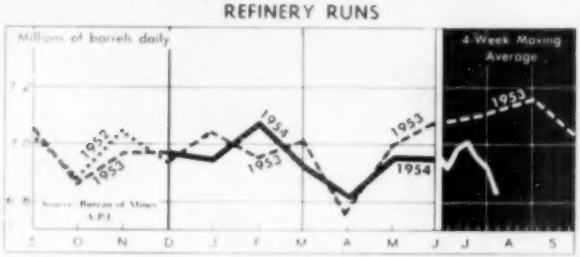
CRUDE-OIL STOCKS BY STATES OF ORIGIN*

(Thousands of barrels)

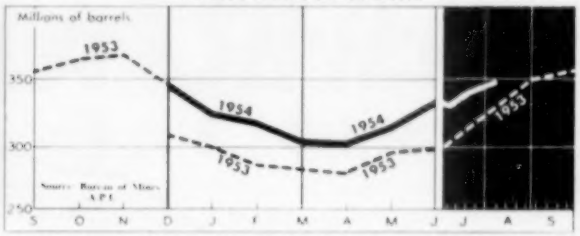
	July 31, '54	July 24, '54	Aug. 1, '53
Pennsylvania Grade	3,124	3,219	2,712
Other Appalachian	1,564	1,685	2,217
Illinois, Indiana, Michigan	12,230	12,664	12,427
Kansas	9,372	9,107	8,953
Oklahoma	26,463	27,282	29,157
Arkansas	3,529	3,541	2,822
Louisiana	16,829	17,646	15,391
North	2,522	2,471	2,373
Gulf	14,307	15,175	13,018
Mississippi	3,227	3,205	3,381
New Mexico	8,830	8,559	7,674
Texas	132,266	130,905	133,250
East Texas proper	11,826	11,871	11,453
West Texas	57,010	56,040	60,113
Texas Gulf	28,891	28,443	26,850
Other Texas	34,539	34,551	34,834
Wyoming	13,360	13,678	14,085
Other Rocky Mountain	5,068	4,746	3,098
California	32,767	32,155	33,684
Foreign	†11,115	11,493	10,293
Total	279,744	279,885	279,144

*Bureau of Mines. †Includes 3,038,000 bbl. in California.

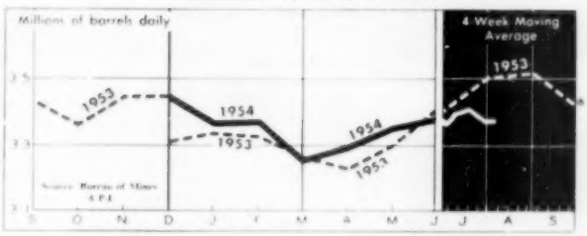
REFINERY RUNS



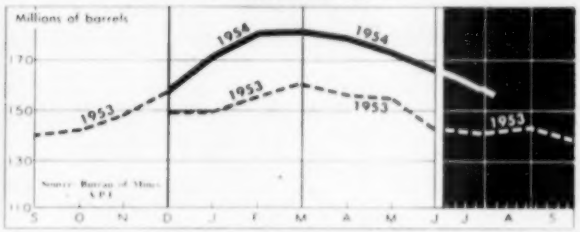
FOUR-PRODUCT STOCKS



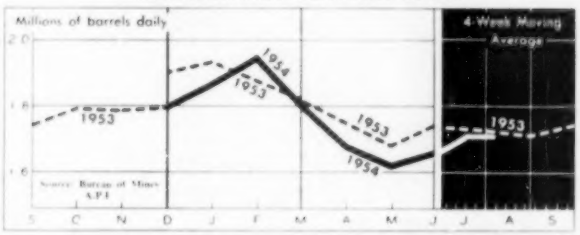
GASOLINE PRODUCTION



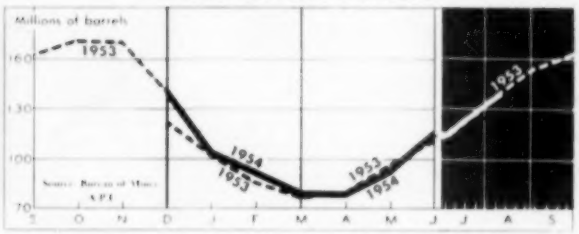
GASOLINE STOCKS



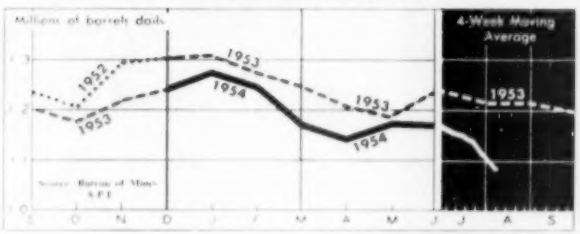
MIDDLE-DISTILLATE PRODUCTION



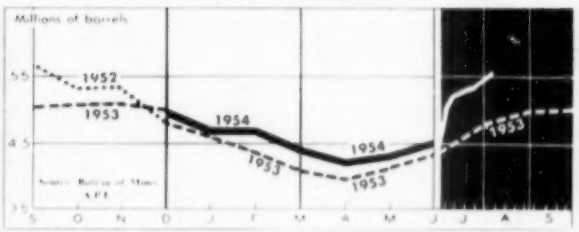
MIDDLE-DISTILLATE STOCKS



RESIDUAL PRODUCTION



RESIDUAL STOCKS



A.P.I. REFINERY REPORT, AUGUST 6

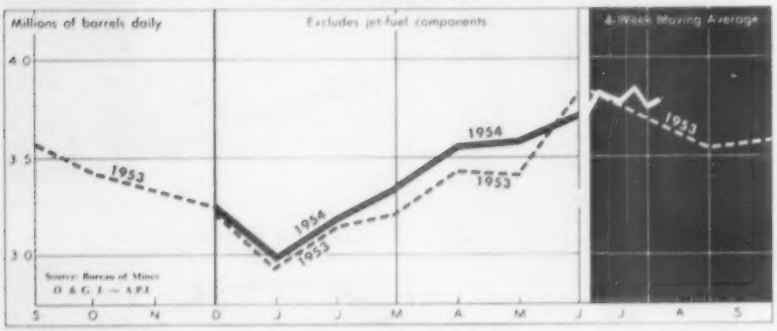
(Excludes all jet-fuel components)

(Thousands of barrels)

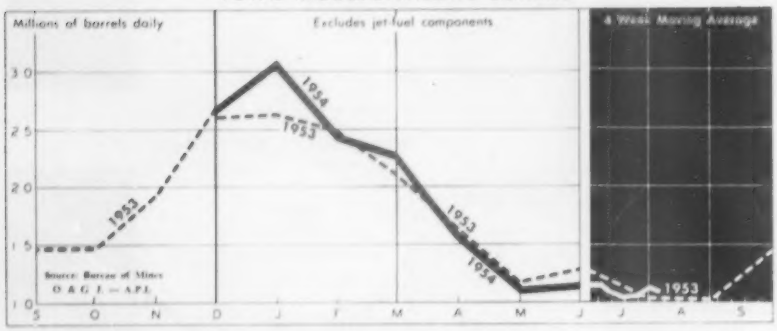
District—	Daily avg. runs	Daily average production: Gaso.*	Kero.	Dist.	Resid.	Stocks‡: Gaso.†	Kero.	Dist.	Resid.	Bureau of Mines, August 1953: Daily avg. runs	Daily average production: Gaso.*	Kero.	Dist.	Resid.
East Coast	1,052	459.8	10.4	282.1	205.2	35,066	13,201	35,063	11,812	1,073	438.7	34.2	251.7	227.4
Appalachian:														
District 1	102	43.9	7.0	20.3	11.3	4,084	561	1,819	483	99	42.1	3.9	18.6	10.6
District 2	79	48.0	2.3	9.7	9.6	2,650	411	747	317	93	52.9	6.7	9.8	11.8
Ind., Ill., Ky.	1,268	671.3	76.6	220.4	129.4	35,429	8,149	21,648	4,871	1,351	740.9	79.4	231.3	168.2
Okla., Kans., Mo.	582	329.0	11.1	133.6	41.7	15,993	1,887	11,659	1,248	642	361.9	21.5	144.4	47.5
Inland Texas	237	155.7	9.9	39.1	22.3	5,610	416	1,843	1,292	266	188.4	8.8	43.1	34.0
Texas Gulf Coast	1,605	804.9	110.1	326.0	224.1	18,888	3,523	11,803	5,997	1,658	828.8	111.5	374.4	240.2
La. Gulf Coast	566	279.4	38.7	161.3	38.4	8,645	2,886	4,144	1,120	551	290.2	40.5	136.4	52.0
N. La. and Ark.	88	33.4	8.0	19.7	4.4	4,001	832	1,127	116	86	33.3	6.3	19.9	4.8
Rocky Mountain:														
New Mexico	17	10.9	1.0	2.6	2.6	220		64	33	21	12.7	0.5	3.5	3.1
Other Rocky Mtn.	241	112.3	2.7	58.7	36.0	7,175	263	2,559	831	260	123.1	3.0	53.5	40.5
California	907	445.1	4.3	100.6	344.3	19,047	410	12,601	27,118	1,063	478.5	4.3	150.1	382.3
Aug. 6, 1954	6,744	3,393.7	282.1	1,374.1	1,069.3	156,808	32,539	105,077	55,238	7,163	3,591.5	320.6	1,436.7	1,222.4
July 30, 1954	6,827	3,332.3	294.4	1,470.6	1,059.9	158,402	31,368	100,439	54,651					
Aug. 8, 1953	7,063	3,422.7	290.6	1,380.6	1,225.1	141,479	31,220	106,460	49,488					

*At refineries including natural blended. †Finished and unfinished. ‡At refineries, bulk terminals, in transit, and in pipelines.

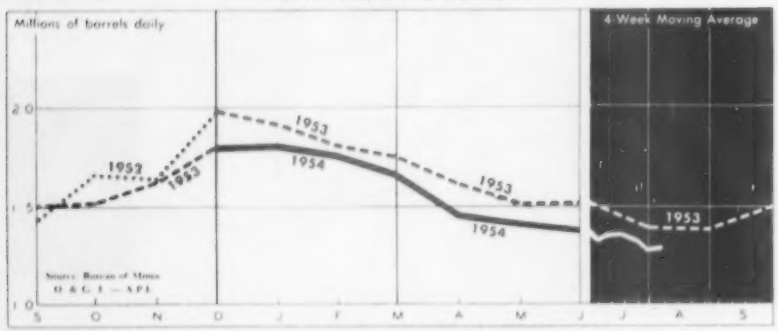
TOTAL GASOLINE DEMAND


Millions of barrels daily
Excludes jet-fuel components
4-Week Moving Average
1953
1954
Source: Bureau of Mines
O & G J — A.P.I.
S O N D J F M A M J J A S

TOTAL MIDDLE-DISTILLATE DEMAND


Millions of barrels daily
Excludes jet-fuel components
4-Week Moving Average
1953
1954
Source: Bureau of Mines
O & G J — A.P.I.
S O N D J F M A M J J A S

TOTAL RESIDUAL DEMAND



REPRESENTATIVE QUOTATIONS

Spot-market quotations of leading suppliers as of August 11, 1954. Prices are in cents per gallon, except for residual in dollars per barrel and wax in cents per pound.

GASOLINE, KEROSINE, AND FUEL OILS

	Mid-Continent Group 3	New York Harbor (barge)	Texas Gulf Coast
Regular gasoline	10.5-11	11.25-12	10.50-10.75
Premium gasoline	11.75-12	13-13.75	11.50-11.75
42-44 w.w. kerosine	9-9.25	9.70-9.95	8.75-9
No. 2 straw fuel oil	8-8.25	8.95	8-8.25
No. 6 residual	$1.10-1.15	$2.05-2.25	$1.85-1.95

NATURAL GASOLINE

	Group 3	North Texas	N. La.
Grade 26-70	4.5	4.0	4.25
Grade 18-55	5.4	4.9	5.15

LUBRICATING OILS
Mid-Continent

150-160 vis., D bright stock, 0-10 pp.	18
200 vis., No. 3 neutral, 0-10 pp.	13.25

WAX
Mid-Continent

132-134 A.M.P.	6.0

• Barge price for No. 2 fuel in New York Harbor moved up 0.25 cent a gallon late in the first week of August. Gasoline prices increased 0.25 cent on the Gulf Coast. Premium gasoline strengthened on the Group 3 market, and movement of heating oil gained.

PRODUCTION AND DEMAND—MAJOR PRODUCTS

(Thousands of barrels daily)

	Refinery prod.	Total demand
Gasoline:		
Four weeks ended 8-6-54	3,374	3,748
May 1954	3,377	3,463
June 1953	3,410	3,838
July 1953	3,501	3,690
Middle distillate:		
Four weeks ended 8-6-54	1,712	1,100
May 1954	1,673	1,169
June 1953	1,747	1,280
July 1953	1,735	1,035
Residual fuel:		
Four weeks ended 8-6-54	1,083	1,290
May 1954	1,148	1,356
June 1953	1,238	1,506
July 1953	1,224	1,390

CRUDE PRICES
GRAVITY SCHEDULE

	Signal Hill, Calif.*	Okla-homa, Kansas	Gulf Coast Tex.†	West Tex.‡
14-14.9	$1.87	....	....	....
15-15.9	1.93	....	....	....
16-16.9	1.99	....	....	....
17-17.9	2.05	....	....	....
18-18.9	2.11	....	....	....
19-19.9	2.18	....	....	....
20-20.9	2.24	$2.50	....	$2.37
21-21.9	2.30	2.52	....	2.39
22-22.9	2.37	2.54	....	2.41
23-23.9	2.45	2.56	....	2.43
24-24.9	2.53	2.58	$2.91	2.45
25-25.9	2.61	2.60	2.93	2.47
26-26.9	2.69	2.62	2.95	2.49
27-27.9	2.76	2.64	2.97	2.51
28-28.9	2.83	2.66	2.99	2.53
29-29.9	2.91	2.68	3.01	2.55
30-30.9	2.97	2.70	3.03	2.57
31-31.9	3.04	2.72	3.05	2.59
32-32.9	3.12	2.74	3.07	2.61
33-33.9	....	2.76	3.09	2.63
34-34.9	....	2.78	3.11	2.65
35-35.9	....	2.80	3.13	2.67
36-36.9	....	2.82	3.15	2.69
37-37.9	....	2.84	3.17	2.71
38-38.9	....	2.86	3.19	2.73
39-39.9	....	2.88	3.21	2.75
40 and above	....	2.90	3.23	2.77

*Standard Oil Co. of California. †Upper Texas Gulf Coast. ‡Includes New Mexico Permian.

Prices east of California effective June 15, 1953. California prices effective February 16, 1953. Pennsylvania Grade prices effective May 20, 1954.

FLAT CRUDE PRICES

Representative posted schedules per barrel.

Louisiana:	
Cotton Valley (distillate)	$3.00
Cotton Valley (Holloway crude)	2.95
Texas:	
East Texas	2.90
Chapel Hill	2.83
Conroe	3.13
Van	2.73
Pennsylvania Grade:	
Bradford	3.00-3.26
Middle District	3.20
Southwest Pennsylvania	2.81
West Virginia	2.75
Ohio	2.74
Illinois Basin	2.90-3.02

Your MARKET PLACE FOR THE OIL AND GAS INDUSTRY... CLASSIFIED ADVERTISING

UNDISPLAYED CLASSIFIED 20c a word one issue. 10% Discount three or more consecutive issues. $4.00 minimum charge. Blind Box in our care nine words. Payable in Advance.

DISPLAY CLASSIFIED
$14.00 a column inch one issue . . .
10% Discount three or more issues.

Address Classified Advertising Material: The Oil and Gas Journal, P. O. Box 1260, Tulsa 1, Okla.

FOR SALE EQUIPMENT

FOR SALE—1 used 2½"-5" x 10" Fig. 1450 Wheatley Power Pump, Ser. WBM 2060, mounted on steel base & DC to Buda motor BTH, Ser. No. 226569A. Price $2000.00. Cities Service Pipe Line Co., Bartlesville, Okla.

FOR SALE—At our Oklahoma City Warehouse, attention T. P. Mace, 1—used 4½" x 10" K Frame Worthington Side Pot Type, Hortz. Duplex Power Pump, Ser. #926421, on steel base, & V-belted to RXB, LFH, Hercules Power Unit, #122674, suitable to mud pump for conversion to mud service. Price $2000. Cities Service Pipe Line Company, Bartlesville, Okla.

Gaso Duplex 4½" x 6" Power Pumps with Chrysler C-36 Engines, skid mounted, immediate delivery. Also Byron Jackson, Carter Centrifugal Units. Westinghouse 20-25-50 KW Generating Units.
H. H. COFFIELD
Attn.: W. H. ORR
Phones: 132—Rockdale, Texas
AT-3427—Houston, Texas

FOR SALE
8" Line Pipe

250,000' 8⅝" OD 28.55# Lapweld

All used #1 grade, machine cleaned, straight, 20' single random lengths, ends beveled. Suitable installation oil, water or gas pipeline systems 850 to 900# PSI. Large additional quantities same size in process, taking up and reconditioning. Priced attractively, prompt shipment, Carrollton, Mo.

Write — Wire — Phone

HUMBOLDT-CHICAGO PIPELINE PROJECT

125 W. 3rd St. Tulsa, Okla.

Phones 2-9128 — 54-4229

FOR SALE EQUIPMENT

WELL DRILLING EQUIPMENT. New and used spudders, rotaries, core drills. Tools, pipe, cable. Everything for well drilling. Fishing tools rented. Pressey & Son, Pueblo, Colo.

SALES and rentals of cable drilling and fishing tools, casing and equipment, from the Southwest's largest stock of used cable tools and oil field supplies. Degen Pipe and Supply Co., Tulsa, Oklahoma.

WILSON ATLAS. Sales Price—$21,000.00. Equipped with two L1-600 Cummins Diesel Engines in good condition: includes pump drive, 12 PD groove sheave and V-belts. One American cathead and one plain spool cathead. Compound enclosed oil-bath. Includes one 1000 gal. fuel tank. Contact Cardwell, Houston.

FOR SALE: 2—90 HP Twin Superior Compressors. Alfred B. Kern Co. 227 Wright Bldg., Tulsa 3, Okla.

FOR SALE

Thermal cracking refinery complete with lead plant 1250 barrel capacity presently operating manufacturing regular and premium gasolines, tractor fuel, diesel fuel and fuel oil. Located T&NO Railroad four miles from Lafayette, La. Population 40,000.
BREAUX BRIDGE OIL REFINING CO., INC.
P. O. Box 356, Breaux Bridge, La.
Telephone 7126

FOR SALE
INGERSOLL-RAND
GAS ENGINE DRIVEN COMPRESSORS

1—	XVG-8	—350 H.P.
1—	XVG-6	—250 H.P.
1—	XVG-4	—150 H.P.

ANY COMBINATION COMPRESSOR CYLINDERS. SPECIFY INLET AND DISCHARGE PRESSURES. PROMPT DELIVERIES.

EARL E. KNOX COMPANY
TELEPHONE: 2-5204
BACON STREET, ERIE, PA.

FOR SALE EQUIPMENT

WILSON GIANT, San Juan Basin, with 2-V12 Le Roi, 131' L. C. Moore, Sub-structure, Blowout Preventer, 7¼ x 14 Pump, 5000' 4½" D.P., 10 Drill Collars, complete ready to run. P. O. Box 1626, Wichita Falls, Texas.

FOR SALE: 1 Mayhew 2000 heavy duty drill with auxiliary motor and 5 x 8 pump mounted on tandem drive Ford truck. In A-1 condition. Lewis & Clemens Drilling Co., Box 101, Princeton, Indiana, Telephone 1460.

WILSON GIANT—Serial No. 6383. Sales Price—$6,000. Equipped with Two Waukesha 145 GK Engines in good condition. General Appearance—Fair. Rig used for Work-Over. Price includes Kelco Spinning and Foster Breakout Catheads; Stromberg - McCreary Air Starters on Engines. Brakes circulating water-cooled; Manual Friction Clutches in Transmission; Others — Jaw Clutches. Rig has Slush Pump Drive and Rotary Drive. Location of Unit—Lake Charles, Louisiana. Contact Cardwell, Houston.

Longer Tool Life!
ARMITE DRILL COLLAR & TOOL JOINT COMPOUND
ARMITE LABS., 6609 Broad St., Los Angeles 1, Calif.
The Wm. H. Mason Co., 212 N. Denver Ave., Tulsa, Okla.

GASOLINE PLANT *FOR SALE*

Gasoline Plant, located in Brazoria County, Texas, shut down in January, 1954. Had been processing approximately thirty-three million feet of gas daily with absorber pressure approximately six hundred thirty pounds. Plant recovered Propane, Butane, Gasoline, Kerosene and Diesel Oil. Adequate storage tanks for all products. Drum Lead Blending Plant. Detailed inventory available upon request.

SOUTHERN PRODUCTION CO., INC.
P. O. Box 670, Ft. Worth, Texas

FOR SALE
EMSCO GB 800 RIG

This rig fully equipped with many extras. Less than 45,000' of hole drilled with rig and accessories since new. Inventory includes grooved drum, dynamatic brake, heavy duty mast, 12 foot substructure. 2 pumps including Gardner-Denver 800 H.P. GXR, 3 LRDU Waukesha Diesel Engines, Steel Mud Tanks, 4½" Grade E Hand Banded Drill Pipe, 6¼" and 7¾" Drill Collars. This rig is priced right. For details contact

BOX H-307, THE OIL AND GAS JOURNAL, Tulsa, Oklahoma

FOR SALE EQUIPMENT

FOR SALE: Model "K" Cardwell tubing and rod unit complete with tubing and rod tools, mast, mounted on Ford tandem truck. Melco Drilling Company, Seminole, Oklahoma.

WILSON TITAN, San Juan Basin, 2-LRO Waukesha, 131' Emsco Mast, 10' Sub-structure, 7¾ x 16 Pump, 6000' 4½" D.P., 10 Drill Collars, Blowout Preventer, see on job. P. O. Box 1826, Wichita Falls, Texas.

FOR SALE: New and used Drilling Engines, 110, 140, 170 and 205 HP. Gas, Gasoline or Diesel; Under-Reed Boring Machines; Generating Sets 3 KW to 300 KW. Young Engine Corp., Canton, Ohio. Rep. A. E. Avers, Box 606, Tulsa, Okla.

FOR SALE: 20,000' 2⅛" o.d. seamless line pipe, 20' random lengths. Plain end. Beveled. Never used as line. Good as new, suitable for water, either domestic or commercial. Ideal for gas, air, oil, etc. Priced at 20c. M. J. Regan Pipe Co., Coffeyville, Kan.

GOOD USED SWABBING UNIT

Franks Model 7000 skid, single drum, swabbing unit. Serial 1039, spooling capacity with 9/16" line, 12,675 ft. Power: HB-600 Cummings engine; Wisconsin starting engine. Mounted on 1951 B3-JA-170 213" wheelbase Dodge truck, with Thornton Tandem Drive, 8.25 x 20 tires; 6,600 miles on truck. Unit, engine and truck in first-class condition. Located at Odessa, Tex. Write, wire, or phone Franks Mfg. Corp., Box 3218, Whittier Sta., Tulsa, Okla.

HUMBLE TYPE

1¼" PRESSURE and TEMPERATURE RECORDERS

2¾" DRILL-STEM PRESSURE RECORDERS

OIL FIELD RESERVOIR ANALYSIS EQUIPMENT

ENGINEERING PRODUCTS INC.

(Successors to Engineering Laboratories, Inc. BHP Division)

600 E. 4th St. Phone 2-7223

Tulsa 3, Oklahoma

PLANT LIQUIDATION

8—Stainless steel columns: 8' x 61', 7' x 25', 6' x 64', 6' x 45' 850#, 4' x 110', 4' x 70', 2' x 73', 2' x 39'.

9—Steel columns 7'6" x 56', 7' x 42', 7' x 5', x 70', 6' x 63', 5' x 62', 4' x 72', 3'6" x 63', 2'6" x 60', 2' x 75'.

2—1440 sq. ft. 304 SS exchangers.

2—1125 sq. ft. steel heat exchangers, 850#.

9—Kettle type reboilers, steel & SS 1250, 1125, 750, 660, 400 & 340 sq. ft.

58—Atmosphere heat exchanger units, 304 SS, 715, 477, 358 & 108 sq. ft.

60—Turbine driven centrifugal pumps, SS & Steel, 1" x 1" to 8" x 8".

2—6-stage Pacific pumps 730 GPM.

4—I.R. 8000 GPM pumps PVG-8 engines.

2—Clark MA-4 150 BHP engines.

2—Union Iron Works 30,000#/hr. water-tube boilers 200 PSI complete.

Detailed circular upon request.

BRILL EQUIPMENT COMPANY

4101 San Jacinto St., Houston 4, Texas, Justin 6832

Sell us your surplus equipment

FOR SALE EQUIPMENT

FOR SALE—1 used 2½"-5" x 10" Gaso Power Pump, Fig. 710-S, Ser. #7435, on steel base & V-belted to HXE Hercules motor, Ser. #330493. Price $2000. Cities Service Pipe Line Company, Bartlesville, Okla.

USED MODEL NB-30, 4-sheave Emsco traveling block with #460 B/J hook attached, rated at 100 tons capacity. Reasonably priced. Mountain Iron, Wichita, Kansas, L-D 229.

FOR SALE: #24 W Bucyrus-calf wheels, cat heads, LeRoi sleeve motor mounted on 6 x 6 Studebaker Army truck, approx. 400' of ¾" cable, 750 ft. ⅜" sand line and calf wheel line—bits—bailers—tools extra, any size—CASH $5,500.00. Box 181, Delafield, Wis.

FRANKS MODEL 5000 Spudder — Serial No. 866. Sales Price—$7,500. Equipped with one Cummins HB1-600 Engine in good condition. Brake Rims in fair condition; Brake blocks—Good. General appearance—Good. Chains—Good. Basic Machine equipped with Spudding attachment, Skid and 63' Double Leg Pipe Mast with 8⅝" and 7" Pipe Legs. 4-Sheave Crown of Wilson Manufacture. Price includes Mast Guy Lines. Location of Unit—Western Kansas. Contact Cardwell, Wichita.

FOR SALE

We are moving Four Type 80 Cooper direct Gas Engine driven Compressors to warehouse in Seminole, Okla. These machines are in excellent condition and ready to go into service. We will furnish compressor cylinders correct size for Gasoline plant, or gas booster work. Our price as is or completely repaired, will be low and delivery at once.

Telephone or write

W. S. SMITH.

205 Thompson Bldg.,

Tele. 2-5473

FOR SALE 12" Line Pipe

125,000 Feet—

12¾ O.D. .375 Wall

49.56 lb. Lapweld

All machine cleaned, commercially straight, 20' single random lengths, ends beveled, used, 1st class condition. Suitable installation—oil, water, or gas pipeline systems. 850# to 900# PSI. Large additional quantities, same size, process, taking up, and reconditioning. Priced attractively, for prompt shipments, Welda, Kansas, and Grandview, Mo.

Write, Wire, Phone

HUMBOLDT-CHICAGO PIPELINE PROJECT

125 W. 3rd St. Tulsa, Okla.

Phones 2-9128 — 54-4229

FOR SALE EQUIPMENT

FOR SALE: ENGINE—165 Hp. Climax Model R61, maximum continuous Hp. rating 126. Herndon Drilling Company, 421 Mayo Building, Tulsa, Phone 4-9700.

WILSON SUPER, San Juan Basin, 87' Mast Pole, Substructure, 3000' 4½" D.P., 6 Drill Collars, 7¼ x 12 Pump, complete rig. P. O. Box 1826, Wichita Falls, Texas.

FOR SALE—Wichtex Model X5000 Spudder complete with tools and pipe. Contact Ekco Drilling Corp. Box 1167, Graham, Texas.

PIPE FOR SALE

50,000 feet good used 8" Line Pipe .322 wall, 28.55# Lapweld, 8⅝ OD, 68c per foot. Peter Grimm, 110 Washington Ave., Stamford, Conn.

FOR SALE: # 71-STAR-Continental Motor—rubber shocks derrick—good shape, mounted Int. Heavy truck, runways each side for carrying tools—CASH $3500.00. Box 181—Delafield, Wis.

TWO R. L. CARDWELL Double-Drum Spudders with 85-ft. 4-leg masts, one with 185 hp. W.A.K. and other with 145 hp. G.A.K. Waukesha motor. Draw works and motors recently overhauled. Dog houses, small tools. Machines running at present. Reason for selling, ill health. S. R. Lesseig, GA 7-1932 or P. O. Box 6206, Okla. City or W. D. Cunningham, 89K4, Alma, Okla.

CARDWELL SPUDDERS—2-R.L. Models, complete with light plants, dog houses, wire lines, tools, swabs, tubing and rod tools. Both rigs have heavy 4-legged masts, and are covered with steel tops. Both have good G. K. motors. These rigs are in good shape and are ready to go. Box 593 or phone 496, Shawnee, Okla.

EQUIPMENT NOT IN USE: Did you find a buyer in this column for the equipment you have for sale. Someone wants it and an "Equipment For Sale" classified advertisement in the Journal will find a buyer. See box heading for classified rates or write The Oil and Gas Journal.

SACRIFICE SALE

$9,000

SIX COMPLETELY EQUIPPED MUD LOGGING TRAILERS

$47,000 worth of mud logging equipment, microscope, gas detectors—everything going in one package for $9,000. Owner getting completely out of the business.

Box H-347, The Oil and Gas Journal, Tulsa, Oklahoma

FOR SALE

Complete Rotary Rig equipped with U-10 Draw Works, 2 WAK Waukesha Motors, 7¼" x 14" P-HD Oil Well Pump Unitized with LRO Waukesha and 6" x 12" Oil Well Pump Driven Off Draw Works Compound, 126' Lee C. Moore Cantilever Mast on 6'-6" Substructure, 6400' 4"-14# Drill Pipe, 12—2¼" x 6¼" x 30' Drill Collars, Steel Doghouse, Bunk House, Complete Set of Tools and Accessories. Rig located in West Central Texas.

CENTURY CORPORATION

330 Fidelity Union Life Bldg.

RAndolph 8677, Dallas, Texas

EQUIPMENT WANTED

WILL PAY highest prices for used casing, used line pipe, abandoned leases, or other surplus lease equipment. Your idle producing equipment is worth dollars. Green Pipe & Supply Co., Box 1383, Tulsa, Oklahoma.

MANUFACTURERS AGENT now calling on Oil Production and Oil Refinery Accounts desires new products to introduce into this field. Territory consisting of South Louisiana and Mississippi. Write Box 102, Harvey, Louisiana.

HELP WANTED

SEISMIC Party Chief for work in United States with degree in Geophysics, Geology, or Engineering, age 26 to 35, capable of advancing in small progressive contract seismograph company. Must be good interpreter. Salary commensurate with ability. Please include education and complete brief of experience in first reply. Replies confidential. Box H-331, The Oil and Gas Journal, Tulsa, Oklahoma.

FOREIGN EMPLOYMENT. List of oil companies and drilling contractors showing where to apply for foreign jobs. OIML Co., Box 2603, Tulsa, Okla. $5.00 cash.

PERMANENT EMPLOYMENT with large organization for men to serve as Sales Engineers in electric logging. Will be stationed in large cities in operating areas to do quantitative and reservoir work with electric and radioactive logs. Must have degree in petroleum engineering, geophysics, or geology with a minimum of three years' experience, preferably both field work and reservoir study. Will be given thorough training in log interpretation. Box H-309, The Oil and Gas Journal, Tulsa, Oklahoma.

WANTED—Mathematical Analysis Group has openings for TWO mathematicians or physicists with advanced degrees and background in applied mathematics, numerical analysis and digital computing.

One position involves planning and supervision of numerical analysis and digital computing on reservoir engineering and petroleum production problems.

The other position involves mathematical analysis of refinery, pipe line, and exploration problems, including linear programming for optimum operations.

New laboratory building. Excellent benefits and working conditions. Address letter giving education, experience and salary requirement to Personnel Records Division, Continental Oil Company, Ponca City, Oklahoma.

SEISMIC INTERPRETERS by expanding contracting company for its new method. Minimum requirements, college degree in geophysics or related fields, and 5 years' experience in West Texas, Anadarko basin, or New Mexico. Houston location. All replies strictly confidential. P.O. Box 13148, Houston, Texas.

DUE TO EXPANSION program large independent oil company has openings for assistants in seismic recording and computing. College graduates with at least one year of experience in geophysics desired. Ample opportunity for advancement. Give educational and previous employment details in initial letter and include photograph. All replies confidential. Box H-265, The Oil and Gas Journal, Tulsa, Oklahoma.

WANTED
DRILLING ENGINEERS
PRODUCTION ENGINEERS

For foreign employment by established oil well drilling contractor. Candidates must be graduate engineers of wide technical and practical experience. Salary dependent upon experience and qualifications. Please write, giving full personal history and employment record. Please include telephone number. All applications will be considered confidential.

Box H-355, The Oil and Gas Journal, Tulsa, Oklahoma

WANTED
ASSISTANT SALES MANAGER

to assist in sales of a new Gulf Coast refinery. Prefer a man with at least 10 years' experience along the lines of selling in tankers and barges; also general export business experience desirable. All replies held confidential.

BOX H-359
THE OIL AND GAS JOURNAL,
TULSA, OKLAHOMA

HELP WANTED

PETROLEUM ENGINEERS: Major oil company in South America has varied positions for single graduate engineers. Must have minimum one year each production and engineering experience. Reply giving full details—age, experience, college, military status, etc. Box H-228, The Oil and Gas Journal, Tulsa, Oklahoma.

WANTED: Distributor for Gas Lift Equipment in West Texas. Preferably Engineering or sales organization now operating in West Texas. Commission far above average. Macco Oil Tool Co. Inc., P. O. Box 7288, Houston 8, Texas.

OBSERVERS to operate and maintain advanced type equipment. Field experience and good electronic background essential. Do not apply unless fully qualified. P. O. Box 13148, Houston, Texas.

NATURAL GAS AND GASOLINE SUPERVISOR

Well established, growing oil Company needs man with broad general and technical experience in the field of natural gas operations. Company operations will include handling and delivering of various types of gas on a major scale from different fields.

Applicant must be thoroughly familiar with producing, gathering, treating, dehydrating and processing techniques and economics. Must also be capable of negotiating gas sales contracts and construction contracts.

Salary commensurate with knowledge and experience.

Forward applications, giving age, education, experience, expected salary and references to Mr. J. W. McKinnon, Hudson's Bay Oil and Gas Company Limited, 534—8th Avenue West, Calgary, Alberta, Canada. Applications will be held confidential, if desired.

PETROLEUM ENGINEERS

Experienced graduate engineers or recent graduates, for immediate and future job openings in Saudi Arabia and New York City. For engineering work in development, production, drilling, process, and oil and gas engineering on primary and secondary recovery problems.

CORE EVALUATION ENGINEER

Degree in chemical engineering, physics, or basic engineering, with specific experience in core analysis and evaluation. For work in petroleum laboratory in Saudi Arabia supervising technicians engaged in determining porosities, permeabilities and fluid saturation on core material from Arabian reservoirs. Personal performance of special core work involving very high and very low range permeability determinations by liquids and gases, core resistivity work, capillary pressure determination and possibly relative permeability and water flood studies.

Salary commensurate with education and experience. Write giving full particulars regarding personal history and work experience. Please include telephone number.

Recruiting Supervisor, Box 58

ARABIAN AMERICAN OIL COMPANY
505 Park Avenue
New York 22, New York

HELP WANTED

WANTED: Manufacturers representatives with good following calling on Oil Producers and Supply Stores to represent Manufacturer of the Hunter Flex-Seal oil well pump plunger and packing means for same. Wants Commission Sales Representatives for following territories: Kansas, Arkansas and North Louisiana, East Texas, West Texas, and California. Please give details concerning present Sales Coverage first letter. All replies confidential. W. H. Hunter Engineering Company, 180 Marlborough Dr., Pontiac 19, Michigan.

ENGINEERS, Executives, Technical Men. Salaried positions—$6,000 to $30,000. This confidential service for outstanding men who desire a change of connection. Will develop and conduct preliminary negotiations without risk to present position. Send name and address for details. Tomsett Associates, 434 Frick Bldg., Pittsburgh 19, Pa.

GRADUATE CHEMICAL ENGINEER for work in research laboratory of major oil company; also Sales Engineer with degree in chemical or mechanical engineering and experienced in Liquefied Petroleum gas products sales and distribution. State experience and qualifications. Box 521, Tulsa, Oklahoma.

SOUTH AMERICA. Major Oil Company. Our fee paid. Mechanical Engineer—Petroleum Engineer—Chemical Engineer—All requiring Degree, experienced or inexperienced. Geologist, single. Must have degree, some experience. Tool Pusher—under 40, three years' experience. Accountant—Degree, Accounting major, single. All information confidential. Contact CHAS. J. LOVELESS PERSONNEL SERVICE, 616 S. Main, Tulsa, Oklahoma. Phone 4-3193.

EXPERIENCED MAN wanted to supervise construction and operation of natural gas transmission system in Southeastern Kentucky. Also desirable to have knowledge of natural gas production. State salary desired and qualifications. Box H-364, The Oil and Gas Journal, Tulsa, Oklahoma.

SALES REPRESENTATIVE — Top-notch man who knows engineering and construction business from A to Z. Preferably familiar with petroleum refining. Outstanding opportunity. Box H-352, The Oil and Gas Journal, Tulsa, Oklahoma.

WANTED—Graduate engineer, thoroughly experienced in all phases of core analysis work, by established commercial core laboratory. Profit participation for proven ability and loyalty. In reply, state qualifications and salary expected. Abilene Sample Log Service, P.O. Box 1939, Abilene, Texas.

EXPERIENCED SALES MANAGER WANTED

to organize sales division for a new oil field and pipeline unit. Must have experience with specialty salesmen and supply house contacts. Age 28 to 40 and capable of earning $25,000 per year.

Box H-346, The Oil and Gas Journal, Tulsa, Oklahoma

CHEMICAL ENGINEER
UNUSUAL OPENING

Exceptional opportunity with small well established engineering firm for young chemical engineer—preferably major company or equivalent experience. Good educational background and 3 years or more experience with modern refinery processing and design, especially catalytic cracking and general refinery economics. Activities very diversified in desirable U. S. location. Some but not continuous traveling.

This position offers outstanding opportunity for ambitious and resourceful engineer who can take responsibility for many diverse activities in petroleum refining and chemical fields. Salary commensurate with ability.

Box H-363
THE OIL AND GAS JOURNAL,
Tulsa, Oklahoma.

HELP WANTED

EXPERIENCED Tank and Tubular Goods salesman with established contacts. Write Box H-360, The Oil and Gas Journal, Tulsa, Oklahoma.

SITUATIONS WANTED

REGISTERED CIVIL ENGINEER, B.S. 1940, 14 years experience, 7 years supervision in construction and operation of large gas pipelines, desires responsible position with pipeline or engineering company. P. O. Box 1268, Alexandria, La.

M.S. IN CHEMISTRY, 28, married, ambitious, 5½ years varied operating experience: Gasoline, Sulfur, Girbotol Plants. Research, Laboratory organization. Technical papers published. Presently holding responsible position. Desires relocation with opportunity for advancement. Box H-351, The Oil and Gas Journal, Tulsa, Oklahoma.

PETROLEUM ENGINEER—Age 31, married, nine years experience reservoir engineering including water floods, drilling and production problems, production geology. Desire opportunity for management position. Box H-353, The Oil and Gas Journal, Tulsa, Oklahoma.

GEOPHYSICAL SUPERVISOR, 17 years with major oil company, desires other connections. Seismograph experience, surveyor, observer, interpreter, party chief, supervisor. B.S. in Civil Engineering. Age 45. Rocky Mountain Region preferred. Box H-354, The Oil and Gas Journal, Tulsa, Oklahoma.

GEOPHYSICIST—Nine years experience Major Geophysical Company, desires employment, permanent location or foreign. Box 476, Taft, Calif.

PIPELINE SUPERINTENDENT—B.S. Mechanical Engineering, B.S. Administration. Thorough experience in designing and installing automatic pump stations, piping layout, remote control equipment and operations. Thirteen years experience with major oil company. Under 40. Box H-348, The Oil and Gas Journal, Tulsa, Oklahoma.

GEOLOGIST wishes to represent parties interested in the acquisition of leases and royalty or drilling deals. Well qualified to undertake any operation. Experience includes Mid-Continent and Rocky Mountain Region as well as foreign service. Degrees in Geology and Geophysics. Box 9752, Fort Worth, Texas.

GEOLOGIST, 33. Married. 7 years experience in Gulf Coast and South Texas with large Independent. Desires to establish with smaller and aggressive Independent. Will relocate. Box H-350, The Oil and Gas Journal, Tulsa, Oklahoma.

YOUNG AMBITIOUS Geologist, MS degree, two years seismic experience, desires challenging position. Box H-357, The Oil and Gas Journal, Tulsa, Oklahoma.

GRADUATE ENGINEER: Three years experience in industrial and oil field sales; some background in personnel work. Prefer to locate in Tulsa. Available September 1st. Box H-361, The Oil and Gas Journal, Tulsa, Oklahoma.

ASSISTANT GENERAL Manager-Landman desires new connection. Fifteen years experience with independents. Negotiate farmouts and trades, evaluate submittals. Fully experienced in Federal Oil & Gas. Manage office and personnel. Have accounting background familiar with tax problems, oil accounting systems, routines. Age 38. BBA degree. Box H-344, The Oil and Gas Journal, Tulsa, Oklahoma.

Well organized, well established oilwell drilling contractor desires the management and supervision of oil properties in West Texas, Central Texas, and New Mexico. Can provide complete handling of oil properties, from acquisition to production. No properties too small, and none too large to handle. Inquiries from independents, groups, small or medium sized oil companies invited. Write, wire, or call collect for further information.

MAKIN DRILLING COMPANY
P. O. Box 1628, Hobbs, New Mexico.
Phone 3-3141.

146 Allen Building, Midland, Texas.
Phone 2-2962.

SITUATIONS WANTED

GEOPHYSICIST—seven years experience Southwest, desires location with independent company. Box H-318, The Oil and Gas Journal, Tulsa, Oklahoma.

GRADUATE PETROLEUM ENGINEER, registered professionally in Oklahoma, five years varied major company experience in drilling and production. Desire position with active independent in Rocky Mountains, Oklahoma or North Texas. Box H-313, The Oil and Gas Journal, Tulsa, Oklahoma.

GEOPHYSICIST with extensive interpretation and supervisory experience desires employment at permanent location or foreign assignment. Degrees and advanced studies in geology and engineering. Box H-293, The Oil and Gas Journal, Tulsa, Oklahoma.

REGISTERED PROFESSIONAL Engineer: With broad experience in all phases of oil field operations including water flooding, desires to manage operations or act as consultant. P. O. Box 9678, Dallas, Texas.

FARM BOSS, age 40, competent, aggressive, experienced in production. Now employed but desires to make a change. Desires responsible position with chance for advancement. Prefer Southern area. Box H-320, The Oil and Gas Journal, Tulsa, Oklahoma.

SEISMOLOGIST, seven years experience in West Texas, New Mexico, Colorado, Nebraska and Wyoming desires position as interpreter or geophysical assistant in a permanent or semi-permanent location. Best references. Box H-332, The Oil and Gas Journal, Tulsa, Oklahoma.

GENERAL MANAGER or Field Superintendent with independent or individual. Petroleum Engineering degree, 10 years varied drilling, production and management experience. Salary or salary and interest. Box H-340, The Oil and Gas Journal, Tulsa, Oklahoma.

ACCOUNTANT—Heavy executive experience as chief accountant in producing and drilling operations. Qualified tax man. Desires similar position with independent operator. Box H-317, The Oil and Gas Journal, Tulsa, Oklahoma.

PETROLEUM PRODUCTION Engineer—Seven years' experience with major in drilling, primary and secondary recovery operations. Age 34; married; presently employed. Desires responsible engineering position with established producing company in Mid-Continent, Permian Basin, or Rocky Mountain areas. Box H-358, The Oil and Gas Journal, Tulsa, Oklahoma.

MINING GEOLOGIST—Ph.D., employed, would like to serve gas or oil company intending to enter the field of the rare and radioactive ores, either in a consulting capacity or full-time employment. References available. Box H-349, The Oil and Gas Journal, Tulsa, Oklahoma.

GRADUATE PETROLEUM ENGINEER, 8 years major company in production, reservoir engineering, secondary recovery, proration, drilling. Desires change. Box H-356, The Oil and Gas Journal, Tulsa, Oklahoma.

LEASE AND DRILLING BLOCKS

SHALLOW PRODUCTION: Want an oil or gas well drilled, see Carroll & Jones, Inc., cable tool drilling contractors (formerly Carroll Drilling Corporation) for leases, drilling deals, and water flood properties. Phone 4637, or write P.O. Box 655, Bowling Green, Kentucky.

FOR SALE: 320-acre lease, Chautauqua County, Kansas. One well producing eight barrels daily from Arbuckle lime. Contact Thos. C. Forbes, Eureka, Kansas.

GAS COMPANY desires to purchase producing or shut-in gas properties. Also desirous of drilling proven or wildcat gas prospects. Replies confidential. Box H-310, The Oil and Gas Journal, Tulsa, Oklahoma.

SEE A. L. BOWLES, Box 947, Ada, Okla., for drilling deals and producing royalties if you have the cash for Oil Investments.

WILL LEASE 112 acres Mary E. Criswell Survey, Abstract #1772, Section 2, Block C known as the J. W. Burnett Subdivision estate, Young County, Texas. This acreage once good producer, initial production 60 barrels per hour; total depth 4,108 feet. Well completed October 2, 1943; well plugged August 21, 1944. Will lease for $10.00 per acre, one, two or three years. Lessee to pay for title check. P. O. Box 722, Clifton, Arizona.

LEASE AND DRILLING BLOCKS

FOR SALE: Interests in oil producing properties in Shackelford County, Texas and in Dawson County, Texas. Box H-362, The Oil and Gas Journal, Tulsa, Oklahoma.

PRODUCING Water Flood Property: Total 320 acres, one-third developed. Produced 25,000 bbls. last twelve months. $50,000.00 worth of operating equipment. Seven producing wells. For sale at bargain of $125,000.00. Contact Mr. Roger H. Davis, 220 Mercantile Commerce Building, Dallas, Texas.

URANIUM — Approximately thirty-five claims in Big Indian Wash, San Juan County, Utah. For lease to legitimate company who is prepared to core drill and develop properly. Near some of the richest mines in Utah. Wayne Catt, Box 88, Dove Creek, Colo.

LEASES WANTED for immediate drilling operations. Shallow production in proven or semi proven areas. Good farmouts considered. Send full details. Olean Petroleum Development Corp., 201 Masonic Temple Bldg., Olean, N. Y.

320 ACRE Producing Oil Lease offsetting Viola and Hunton production Strahm pool Nemaha County, Kansas. Small Hunton well. Excellent prospects Viola. Cheap. R. D Swan, 1006 Daniel Bldg., Tulsa, Okla.

400 ACRE producing Oil lease. Four wells pumping small production. Negotiation is under way for six more wells. Two for water and four for oil. These will be completed and included in the bargain price for this property. $75,000. Location Rogers County, Okla. Reason for selling Partners disagree. James E. Jenkins, Murray, Nebr.

WILL pay cash instantly for lease (large blocks), royalties, mineral deeds, production. Write fully—P. O. Box 2153, Denver, Colorado.

SOHIO PETROLEUM Company solicits offers to buy its full working interest in the Bolton Water Flood, Montgomery County, Kansas. Bartlesville Sand produced 1906 Bbls. of oil June, 1954. Average Depth Wells —1200', 29 Producing, 43 Water Input, 33 Temporarily Abandoned, 1 Water Supply Well, Water Treating Plant. Water Distribution System, Complete Electric System. Buildings and Equipment. For inspection and complete specifications contact: Sohio Petroleum Company, 1300 Skirvin Tower Hotel, Oklahoma City, Attn.: J. R. Wilson, Jr. Phone REcent 9-0511.

WANTED: Major company wants to acquire oil producing property for experimental purposes. Must be producing from closed sandstone reservoir. Prefer depth less than 1500 feet, at least 10 feet of clean sand, and productive area less than 200 surface acres. Submit details to Box H-343, The Oil and Gas Journal, Tulsa, Oklahoma.

LEASES ROYALTIES
Producing and Nonproducing
Bought and Sold—Any Area
Inquiries Invited

B. D. BUCKLEY
6635 Delmar Ave., St. Louis 5, Mo.

WILL PURCHASE PROVEN GAS OR OIL PRODUCTION

Anywhere in the U. S. Will make terms agreeable. Contact

MR. JACK DAVIS
Davis Oil Company
462 7th Ave., NYC., N.Y.
Telephone: LAckawanna 4-0570

LOST AND FOUND

REWARD FOR RETURN OF DIAMOND CORE BIT: Lost one 6¾ by 1¾ HH-40 Wire Line Diamond Core Bit, Serial No. UC-2 containing diamonds weighing 390.32 cts. Reward for information leading to recovery. Box H-311, The Oil and Gas Journal, Tulsa, Oklahoma.

BUSINESS OPPORTUNITIES

FOR SALE: Well established tank company, doing business of erection, dismantling and repairing large storage tanks. Located in Tulsa County. Write H. O. Jones, Box 2297, Tulsa, Okla.

ROYALTIES

QUOTE ME your highest price for one-half of two-thirds interest royalty out of 96.6 acres, J. C. Stewart Survey, Abstract #1880, Section 2, Block C, known as the J. W. Burnett Subdivision Estate, Young County, Texas. Lessee to pay for title check. P. O. Box 722, Clifton, Arizona.

FOR SALE: Landowners royalty on four-hundred acres in West Sage Stouctune, Big Horn County, Wyoming, one mile from production. Leased to Major Company. Box H-328, The Oil and Gas Journal, Tulsa, Oklahoma.

WANTED TO BUY Producing Royalties. Submit full particulars for our engineer's approval, including payments, plat, etc. Box 276, Rutherford, N. J.

JACK EAGLE, Oil Properties, 706 City Nat'l Bldg., Oklahoma City, Oklahoma. Telephone REgent 6-7027.

OFFERING CHOICE PRODUCING oil income royalties with large reserves per Dollar investments. A. S. Berry, 522 Wright Bldg., Tulsa, Okla.

MAP STICKS

KRAFTBILT, ALL-PLASTIC SNAP-ON MAP STICKS: Light-weight resilient plastic clips snap maps to sticks in seconds—eliminate rolled map-handling problems. Bright colored Index Flags—plugged in one end of sticks, carry labeled identity and instantly "flag" the maps you want. Send for Catalog 352-A, Ross-Martin Co., P.O. Box 800-A, Tulsa, Okla.

BUSINESS SERVICE

Delaware Corporations formed and serviced, American Guaranty & Trust Company, P. O. Box 487, Wilmington, Delaware.

REAL ESTATE

RANCH FOR SALE

4500 acre deeded ranch in Montana, one hour west of Billings. 300 cow capacity. 400 acres hay of which 250 acres is irrigated. 350 acres winter wheat. Two-year-old modern home, two fireplaces, six bedrooms, four baths, natural gas heat. Cabin on trout stream near house. School bus. Will sell with or without cattle and/or machinery. Inquiries invited.

A. J. HENRY
Columbus, Montana

GAS MEASUREMENT SERVICE

GAS MEASUREMENT AUDITING

PROTECT YOUR GAS SALES AND PURCHASES WITH THIS ECONOMICAL SERVICE

Rates as low as 2.00 per well per month. All charts and factors checked by experts.

Complete report furnished.

JOHN P. SQUIER CO.
P. O. Box 6100 Dallas 22, Texas
Woodlawn-4484

ADVERTISERS IN THIS ISSUE

ACF Industries Incorporated 37
Alexander Shipyard Inc. 154
Allis-Chalmers Mfg. Co. 29
Allis-Chalmers Mfg. Co. (Tractor Division) 50
Allen Foundry & Machine Works, Inc. 194
American Brass Co., The 40
American Locomotive Company 30, 31
American Manufacturing Co. of Texas 5
American Meter Company 67
American Recording Chart Co. 152
Appleton Electric Company 41
Arrow-Hart & Hegeman Electric Co. 165
B and W Inc. 199
Baash-Ross Tool Company 141
Baker Oil Tools, Inc. 175
Barrett Division of Allied Chemical & Dye Corp. 2
Bauer & Black Division of The Kendall Company 57
Bendix Aviation Corporation 18
Bethlehem Steel Co. 97
Black, Sivalls & Bryson, Inc. 15
Bower Roller Bearing Company 26
Brodie Co., Inc., Ralph N. 13
Burgess-Manning Company 68
Carter Company, Inc., S. C. 56
Caterpillar Tractor Co. 7
Chain Belt Co. 64
Charles Machine Works, The 188
Chemicals & Material Corp. 164
Chevrolet Motor Div., General Motors Corp. 27
Cities Service Oil Co. 20
Clark Equipment Company, Construction Machinery Division 19
Classified Advertising 217, 218, 219, 220
Climax Engine and Pump Mfg. Co. 34
Colorado Fuel and Iron Corporation, CF&I Tubular Products 43
Connally, Inc. 164
Continental Supply Co., The 74, 75, 204, 205
Cooper-Bessemer Corp., The 95
Coppus Engineering Corp. 3
Crose Manufacturing Co., Inc., M. J. 161
Cutler-Hammer, Inc. 48
Dana Corporation 53, 54
Darling Valve and Mfg. Co. 55
Dean Brothers Pumps, Inc. 154
Delta C&S Air Lines 196
Dia-Log Company, The 8
Diamond Alkali Company 32
Dow Chemical Company, The 51
Dowell Incorporated 203
Drilling & Service, Inc. 208
du Pont 35, 36
Edward Valves, Inc. 187
Electric Controller & Mfg. Company, The 177
Emsco Manufacturing Company 176, 204, 205
Equitable Equipment Co., Inc. 200
Fairbanks, Morse & Co. 69
Farrel-Birmingham Co., Inc. 65
First National Bank of Shreveport, The 161
Fleet-Line Co. 164
Fluor Corporation, Ltd., The 17
Ford Alexander Corporation, The 8
Fort Worth Steel & Machinery Co. 207
Foxboro Company, The 44
Funk Aircraft Co. 154
General Electric Company 38, 39, 189
General Geophysical Company 186
Goodall Rubber Company 170
Gott Mfg. Co., H. P. 161
Grancell, I. H. 167
Gulberson Corporation 148
H & M Pipe Beveling Machine Company 162
Halliburton Oil Well Cementing Co. Inside Front Cover, 145
Hamer Valves, Inc. 173
Harnischfeger Corp. 21
Hazard Wire Rope Division of American Chain & Cable Co., Inc. Inside Back Cover
Houston Contracting Company 160
Hughes Tool Co. Back Cover
Humble Oil & Refining Co. 149
Inferno Co., The 188, 198
Infilco Inc. 147
Interstate Electronic Supply Corp. 188
Jensen Brothers Mfg. Co. 197
Johns-Manville Corporation 28
Johnston Testers, Inc. 52
Jones & Laughlin Steel Corporation Supply Division 45
Kaiser Steel Corporation 61
Kellogg Co., The M. W. 71, 72
Kinzbach Tool Co., Inc. 154
Klinger Limited, Richard 153
Kobe, Inc. 6
Lane-Wells Company 78, 200
Larkin Packer Company, Inc. 137
Leland Equipment Co. 193
Lone Star Cement Corporation 82
Lufkin Foundry & Machine Co. 16
Macco Oil Tool Co. 176
Maintenance Engineering Corp. 60
Mark & Company, Clayton 146
Marley Company, The 70
Martin-Decker Corporation 14
Mayo Hotel, The 183
McCullough Tool Company 133
McKee & Co., Arthur G. 77
Midwest Piping Company, Inc. 24
National Airoil Burner Co., The 163
National Radiator Company, The 46
National Supply Co., The 58, 59
National Tank Company 222
Nelson Electric Mfg. Co. 185
Norris Manufacturer, Inc., W. C. 106
Oil and Gas Journal, The 199
Oil Well Supply Co. 4
OPW Corporation 9
Parco Company, The 160
Parish Pressed Steel Company 54
Parkersburg Rig & Reel Co. 12
Parsons Co., The Ralph M. 66
Peerless Supply Co. Inc. 164
Phoenix Manufacturing Company 144
Pipeline Anode Corp. 174
Powell Valves 10
Ratigan, Inc., J. P. 176
Reda Pump Company 69
Reed Roller Bit Company 201
Republic National Bank of Dallas 206
Republic Rubber Division of Lee Rubber & Tire Corp. 42
Republic Steel Corporation 33
Rockwood Sprinkler Company 25, 180, 181
S&R Tool & Supply Co. 144
Seismograph Service Corp. 191
Smith Corporation, A. O. 11
Smith Oil Tool Co., H. C. 166
Snare Corporation, Frederick 134
Southern Mill & Mfg. Co. 184
Southwest Industries, Inc. 99
Spicer Mfg., Div. of Dana Corp. 53
Steel Forgings, Inc. 164
Technical Oil Tool Corp. 179
Tex-Tube Inc. 156
Thompson Tool Co. 198
Timken-Detroit Axle Division Rockwell Spring and Axle Company 22, 23
Timken Roller Bearing Company Front Cover
Ultra Violet Products, Inc. 160
United States National Bank 135
United States Rubber Company 47
U. S. Steel Corp. Subsidiaries 4, 49
United States Steel Supply 49
Universal Oil Products Co. 62, 63
Warner Lewis Company 68
Web Wilson Oil Tools 168
Welex Jet Services Inc. 60
Well Equipment Mfg. Corp. 76
Western Supply Company 183
Willson Products, Inc. 73
Wood's Sons Co., T. B. 168
Youngstown Sheet and Tube Company 101

LEGAL

SEALED BIDS for Oil and Gas leases on the Crow Indian Reservation, Montana, will be received in the Office of the Superintendent, Crow Agency, Montana, until 2:00 o'Clock P.M. (M.S.T.), Wednesday, September 8th, 1954, at which time they will be opened and publicly read. Sixty-two (62) Units involving 16,383.40 acres of individually owned trust lands, a portion of which mineral rights are reserved for the benefit of the Crow Tribe by Act of Congress, will be offered. For further detailed information and a list of lands advertised, call or write: L. C. Lippert, Supt., Crow Indian Agency, Crow Agency, Montana.

LEGAL

NOTICE OF OIL AND GAS LEASE SALE
Under Sealed Bid on August 24, 1954
FORT BERTHOLD INDIAN AGENCY
New Town, North Dakota

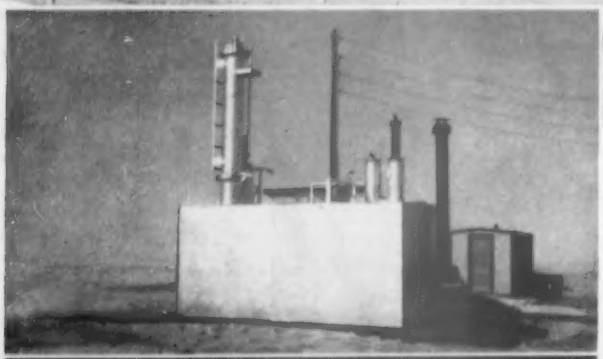
Sealed bids for Oil and Gas Mining Leases on restricted Allotted lands of the Fort Berthold Indian Reservation, North Dakota will be received at the Office of the Superintendent of said reservation, New Town, North Dakota until 2:00 P. M., Central Standard Time on August 24, 1954, and will be opened immediately thereafter in the presence of such bidders as may attend. The total allotted land covered by the advertisement is 22,419.80 acres. All of this land is located in Dunn County, State of North Dakota. For additional information write the superintendent of the Fort Berthold Agency, New Town, North Dakota, or call the Agency Land Office, phone 74340, New Town.

Ralph M. Shane
Superintendent.

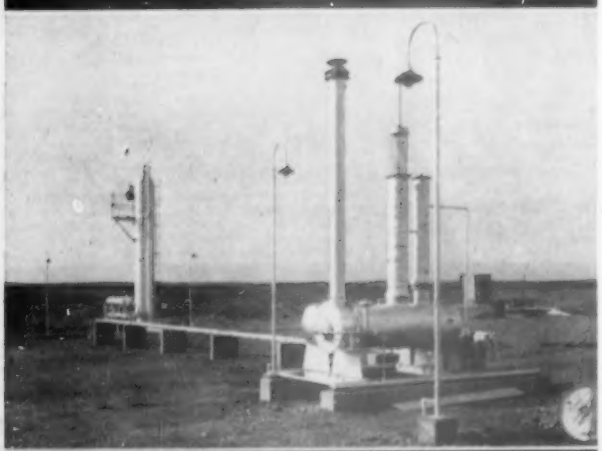
Dated July 24, 1954

NATIONAL GLYCOL DEHYDRATION AND LOW TEMPERATURE EXTRACTION (LTX®)

Equipment



National 500 mcf/day, 125 # WP Glycol Dehydrator — N. Dakota



National 17 mmcf/day, 1000 # WP Glycol Dehydrator — Kansas

A 30" x 12½', 1200 psi LTX with Glycol Injection and a 24" x 15', 300 psi Stabilizing Desorber for 10,000 mcf per day operating on lease in South Texas.

This producer is realizing

MAXIMUM DOLLAR RECOVERY FROM HIS RESERVOIR

It's National®

NATIONAL TANK COMPANY

TULSA, OKLAHOMA

6-6-52

"Very good. We stopped in to see the local Hazard distributor and had him show us their ton-mile book. I thought it would be complicated but the way it's laid out we got the idea immediately.

"We bought a line from him and kept track of every tour just the way the log sheets in the Hazard ton-mile book call for, and we follow the cutoff system according to instructions. We've already got more service out of the Hazard LAY-SET Preformed drilling line than out of any others we've used, and the Hazard line looks like it's good for a long time yet."

The days are gone when you could put on a line, run it to death, then get a new one. You'd go broke operating that way today. Get the habit of seeing how many ton-miles you can get from a drilling line... to be specific, a HAZARD LAY-SET Preformed rotary drilling line.

Your nearby HAZARD distributor has a stock of all popular drilling lines and can give you quick service. Let him tell you why they're so good, and let him show you how easy you can put a ton-mile book to work on your rig. You'll save money if you do. See him today.

HAZARD WIRE ROPE DIVISION
American Chain & Cable Company, Inc.

PLANTS: Houston, Tex., Wilkes-Barre, Pa.
OFFICES AND WAREHOUSES: Odessa, Tex., San Francisco, Portland, Ore., Pittsburgh, Philadelphia, New York, Los Angeles, Denver, Chicago, Atlanta • Bridgeport, Conn.

Our interests are the same

...getting your well down in shortest possible time!

HUGHES research and the combined efforts of the HUGHES field organization* have *one purpose* . . . giving you bits that will get your well down in the least possible time . . . and at the least possible cost.

The HUGHES man responsible for servicing your rig knows from actual field experience the bits that will give you the fastest penetration and most footage in the formations you are likely to encounter. And you can depend on him to have the right bits on your rig at the right time.

**A field organization of over 400 serves the industry in the United States and Canada*